

Opening of Specialty Cardiac Hospitals and Use of Coronary Revascularization in Medicare Beneficiaries

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SPECIALTY HOSPITALS, WHICH PROVIDE care limited to specific medical conditions or procedures, are opening at a rapid pace across the United States.¹ Proponents argue that specialty hospitals provide higher-quality health care and greater cost-efficiency by concentrating physician skills and hospital resources needed for managing complex diseases.^{2,3} Critics claim that specialty hospitals focus primarily on low-risk patients and provide less uncompensated care, which places competing general hospitals at significant financial risk.^{4,5}

However, specialty hospitals raise an additional concern beyond their potential to simply redistribute cases within a health care market. Specialty hospitals are typically smaller than general hospitals and have high rates of physician ownership.⁶ Physician owners may have stronger financial incentives for providing services that fuel greater utilization. Evidence for the potential of "physician-induced" demand of services exists in other health

Context Although proponents argue that specialty cardiac hospitals provide high-quality cost-efficient care, strong financial incentives for physicians at these facilities could result in greater procedure utilization.

Objective To determine whether the opening of cardiac hospitals was associated with increasing population-based rates of coronary revascularization.

Design, Setting, and Patients In a study of Medicare beneficiaries from 1995 through 2003, we calculated annual population-based rates for total revascularization (coronary artery bypass graft [CABG] plus percutaneous coronary intervention [PCI]), CABG, and PCI. Hospital referral regions (HRRs) were used to categorize health care markets into those where (1) cardiac hospitals opened ($n=13$), (2) new cardiac programs opened at general hospitals ($n=142$), and (3) no new programs opened ($n=151$).

Main Outcome Measures Rates of change in total revascularization, CABG, and PCI using multivariable linear regression models with generalized estimating equations.

Results Overall, rates of change for total revascularization were higher in HRRs after cardiac hospitals opened when compared with HRRs where new cardiac programs opened at general hospitals and HRRs with no new programs ($P<.001$ for both comparisons). Four years after their opening, the relative increase in adjusted rates was more than 2-fold higher in HRRs where cardiac hospitals opened (19.2% [95% confidence interval (CI), 6.1%-32.2%], $P<.001$) when compared with HRRs where new cardiac programs opened at general hospitals (6.5% [95% CI, 3.2%-9.9%], $P<.001$) and HRRs with no new programs (7.4% [95% CI, 3.2%-11.5%], $P<.001$). These findings were consistent when rates for CABG and PCI were considered separately. For PCI, this growth appeared largely driven by increased utilization among patients without acute myocardial infarction (42.1% [95% CI, 21.4%-62.9%], $P<.001$).

Conclusion The opening of a cardiac hospital within an HRR is associated with increasing population-based rates of coronary revascularization in Medicare beneficiaries.

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care settings like clinical laboratory and diagnostic imaging centers where self-referral by physician owners is restricted by federal law.^{7,8} Thus, the opening of a specialty hospital may be expected to raise utilization more than by simply adding increased capacity for procedures to a market.

We sought to assess whether the opening of specialty cardiac hospitals was

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associated with greater utilization of coronary revascularization services. We focused on cardiac hospitals since two thirds of Medicare payments to specialty hospitals are related to cardiac conditions.⁹ To better distinguish the particular effects of specialty hospitals from the simple addition of capacity to a market, we separately compared areas where a cardiac hospital opened with those where new cardiac programs were introduced at general hospitals.

METHODS

Data Sources and Study

Population

We obtained from the Centers for Medicare & Medicaid Services (CMS) Medicare Provider and Analysis Review (MEDPAR) Part A, Denominator, and Provider of Service files from 1995 through 2003. Part A files include data on acute care hospitalizations. Denominator files contain data on eligible Medicare beneficiaries for that year including demographic and enrollment information. Provider of Service files contain data on hospital providers including facility characteristics and ZIP code locations. Data on all Medicare beneficiaries aged 65 years or older enrolled in fee-for-service programs within the United States were included.

We used the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) procedural codes to identify patients undergoing coronary revascularization with coronary artery bypass grafting (CABG) (ICD-9-CM procedural codes 36.10-36.19) without concomitant aortic or valvular surgery and/or percutaneous coronary intervention (PCI) (ICD-9-CM procedural codes 36.01, 36.02, 36.05-36.07, 36.09). Hospitals that performed these procedures during the study period were identified using the same ICD-9-CM procedural codes. We included all hospitals with at least 3 CABG and/or PCI cases during one of the years in which the hospital reported data. The Institutional Review Board of the University of Michigan and the CMS approved this protocol prior to its

initiation. The requirement for informed consent was waived and approved.

Specialty Hospital Identification

We categorized all hospitals that performed coronary revascularization into cardiac or general hospitals using an approach similar to the General Accounting Office and Cram et al.¹⁰ Specifically, we constructed a cardiac specialty index based on the percentage of cardiac-to-total admissions in Medicare beneficiaries in 2002 and 2003. From this cardiac specialty index, we reviewed the top 100 facilities and selected those that (1) had proprietary or corporate ownership, and (2) did not provide broad medical or pediatric services. Data on additional services available at these hospitals were obtained from the American Hospital Association Annual Survey, the American Hospital Directory, and online hospital Web sites.^{11,12} One cardiac hospital was excluded due to concerns regarding inconsistent participation within the Medicare program during the study period. To supplement this strategy, we also included any cardiac hospitals identified by the CMS during their recent national survey.¹³

As we were specifically interested in examining changes in use of coronary revascularization after the opening of a cardiac hospital, we excluded those that opened prior to January 1, 1996, and after December 31, 2002, to ensure at least 1 year of follow-up data. The year of opening was considered the first year that data were reported to the CMS for either procedure.

Statistical Analysis

We used hospital referral regions (HRRs) from the *Dartmouth Atlas of Cardiovascular Health Care* to identify health care markets.¹⁴ Hospital referral regions are large geographic units representing distinct markets for tertiary care that were developed by studying patterns of hospital utilization for major cardiac surgery among Medicare beneficiaries in the early 1990s. Based on their ZIP code, patients and

hospitals were assigned to 1 of 306 HRRs. Hospital referral regions were categorized into 3 types: (1) HRRs where a new cardiac hospital opened; (2) HRRs where a new cardiac program in CABG and/or PCI opened at a general hospital; and (3) HRRs where no new programs opened during the study period.

We calculated population-based rates for CABG and PCI in each of the 306 HRRs during each year of the study period. The numerator for these rates was the total number of eligible beneficiaries within the HRR who underwent the procedure during that calendar year. The denominator was the total number of eligible beneficiaries within the HRR in June of that year. Rates were adjusted for differences in age (65-69, 70-74, and 75 years or older), sex, and race (black, nonblack) across HRRs and years using direct standardization.¹⁵

Population-based rates of total revascularization (CABG plus PCI), CABG, and PCI were plotted by calendar year with general trends visualized using fractional polynomial regression.¹⁶ We constructed multivariable linear regression models to assess the statistical significance of rates of change across the 3 types of HRRs after the opening of new programs. Repeated measures within HRRs were accounted for using generalized estimating equations with robust variance estimators with a first-order autoregressive correlation matrix structure assumed.^{17,18} Additional correlation matrix structures (second-order autoregressive, exchangeable) were explored and results were robust to this assumption.

Models accounted for trends in time by including year as a categorical variable. We included interaction terms consisting of time since a new program opened by the type of HRR, ie, HRRs where cardiac hospitals opened and HRRs where new cardiac programs opened at general hospitals. Interaction terms took the value of "0" for HRRs with no new programs. Models adjusted for the following HRR-level variables: (1) annual population-based rates of acute myocardial infar-

tion; (2) per capita number of cardiologists and cardiovascular surgeons at the midpoint of the study period; (3) geographic region (Northeast, South, Midwest, West); (4) the opening of multiple new programs (2 or more) over the study period; (5) tertiles of the annual percentage of managed care penetration; and (6) tertiles of a summary score of socioeconomic status¹⁹ calculated from US Census data at the ZIP code level. Nonlinear relationships in rates of change were also evaluated using quadratic terms; results were similar and are not reported.

We performed 3 additional analyses. For PCI, we separately analyzed rates among patients with and without an acute myocardial infarction as identified by ICD-9-CM diagnostic code 410.x1 during their hospitalization. This analysis assessed how our results were influenced by procedural indication. Next, we evaluated rates of change in HRRs prior to the opening of cardiac hospitals or new cardiac programs at general hospitals. This analysis assessed whether cardiac hospitals were selectively opening in already

growing markets. Finally, we examined procedural volumes at cardiac hospitals and new cardiac programs at general hospitals as well as their relative contributions to the number of coronary revascularizations performed within an HRR at the end of the study period. All analyses were performed using Stata version 9.0 (StataCorp, College Station, Tex) and *P* values of <.05 were considered significant. All tests were 2-sided.

RESULTS

We identified 13 HRRs with 14 new cardiac hospitals, 142 HRRs with 245 new cardiac programs at general hospitals, and 151 HRRs with no new programs during the study period. In 2003, the mean (SD) number of beds at the 14 cardiac hospitals was 55 (16), the mean volume of CABG was 233 (151), and the mean volume of PCI was 575 (247). Eleven (79%) of the 14 cardiac hospitals reported providing emergency services, while 1 (7%) reported any affiliation with a medical school. (Specific information regarding the 14 cardiac hospitals available from the authors on re-

quest.) TABLE 1 lists key summary characteristics of the 3 types of HRRs. Hospital referral regions with no new cardiac programs had fewer Medicare enrollees, but rates of total revascularization, CABG, and PCI were not significantly different at the start of the study period. Eleven (85%) of the 13 HRRs where cardiac hospitals opened had at least 1 additional new program open during the study period compared with 50 (35%) of the 142 HRRs where new cardiac programs opened at general hospitals.

FIGURE 1 and FIGURE 2 display population-based rates for total revascularization, CABG, and PCI between 1995 and 2003 across the 3 types of HRRs. There was noticeable separation of rates in HRRs where cardiac hospitals opened starting in approximately 1999, coinciding with the median year of opening for these facilities. The rate of change for total revascularization was significantly greater in HRRs after cardiac hospitals opened when compared with HRRs where new cardiac programs opened at general hospitals (difference, +4.2/10 000 per year [95%

Table 1. Key Summary Characteristics of Hospital Referral Regions (HRRs) by the Presence of New Programs During the Study Period

Characteristic	HRRs With New Cardiac Hospital (n = 13)	HRRs With New Cardiac Programs at General Hospitals (n = 142)	HRRs With No New Programs (n = 151)	<i>P</i> Value
Medicare fee-for-service enrollees per y, mean (SD), No. [1995-2003]	147 097 (78 583)	125 031 (112 202)	56 696 (38 003)	<.001
Medicare managed care enrollees per y, mean (SD), % [1995-2003]	12.6 (13.3)	11.6 (12.9)	11.1 (13.1)	.90
Rates of AMI per 10 000 per y, mean (SD) [1995-2003]	80.7 (13.4)	91.8 (20.0)	87.8 (22.8)	.09
Cardiologists and cardiothoracic surgeons per 100 000, mean (SD), No. [1999]	6.4 (1.2)	7.6 (2.3)	7.2 (2.3)	.12
No. (%) by US region				
Northeast	0 (0)	22 (15)	21 (14)	.38
Midwest	4 (31)	34 (24)	46 (30)	
South	5 (38)	62 (44)	52 (34)	
West	4 (31)	24 (17)	32 (21)	
Regions with >1 new program, No. (%)	11 (85)	50 (35)	NA	<.001
Adjusted rates per 10 000, mean (SD) [1995]*				
Coronary revascularization	111.6 (22.6)	107.3 (22.5)	105.6 (26.8)	.64
CABG	52.3 (14.2)	52.4 (11.6)	50.9 (13.2)	.58
PCI	59.2 (10.6)	54.9 (16.9)	54.7 (20.0)	.69
PCI with AMI	20.0 (3.0)	19.0 (6.1)	20.1 (6.3)	.29
PCI without AMI	39.3 (9.0)	35.9 (12.5)	34.5 (15.5)	.42

Abbreviations: AMI, acute myocardial infarction; CABG, coronary artery bypass grafting; PCI, percutaneous coronary intervention.

*Adjusted for age, sex, and race.

confidence interval [CI], 2.0-6.5]; $P < .001$) and HRRs with no new programs (difference, +4.0/10 000 per year [95% CI, 1.8-6.3]; $P < .001$). Four years after their opening, the relative increase in rates of total revascularization was more than 2-fold higher in HRRs where cardiac hospitals opened when compared with other HRRs (TABLE 2).

Similar findings were noted when we considered rates for CABG and PCI separately (Table 2). Although rates for CABG declined throughout the study period, the rate of change was less in HRRs after cardiac hospitals opened when compared with HRRs where new cardiac programs opened at general hospitals (difference, +2.1/10 000 per year [95% CI, 0.8-3.4]; $P = .001$) and HRRs with no new programs (difference, +1.9/10 000 per year [95% CI, 0.6-3.2]; $P = .005$). The rate of change for PCI also was higher in HRRs after cardiac hospitals opened when compared with HRRs where new cardiac programs opened at general hospitals (difference, +2.4/10 000 per year [95% CI, 0.5 to 4.2]; $P = .012$) and HRRs with no new programs (difference, +2.4/10 000 per year [95% CI, 0.5-4.2]; $P = .011$).

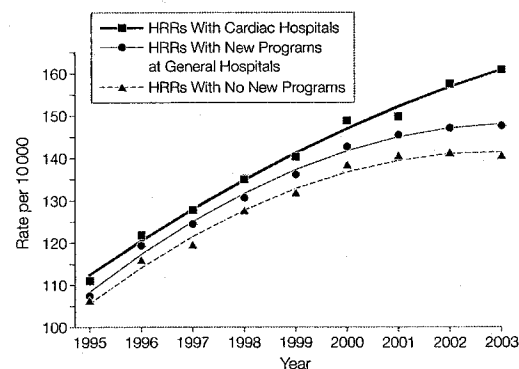
For PCI, these results varied when we considered the strength of the procedural indication (FIGURE 3). Among patients with acute myocardial infarction, no significant differences were

seen in the rate of change for PCI across HRRs after cardiac hospitals opened (difference, -0.4/10 000 per year [95% CI, -0.9 to 0.1]; $P = .15$ when compared with HRRs where new cardiac programs opened at general hospitals; and difference, -0.3/10 000 per year [95% CI, -0.8 to 0.2]; $P = .26$ when compared with HRRs with no new programs). In contrast, the rate of change was significantly higher for PCI among patients without acute myocardial infarction in HRRs after cardiac hospitals opened when compared with HRRs where new cardiac programs opened at general hospitals (difference, +2.7/10 000 per year [95% CI, 1.1-4.3];

$P = .001$) and HRRs with no new programs (difference, +2.6/10 000 per year [95% CI, 1.0-4.2]; $P = .002$).

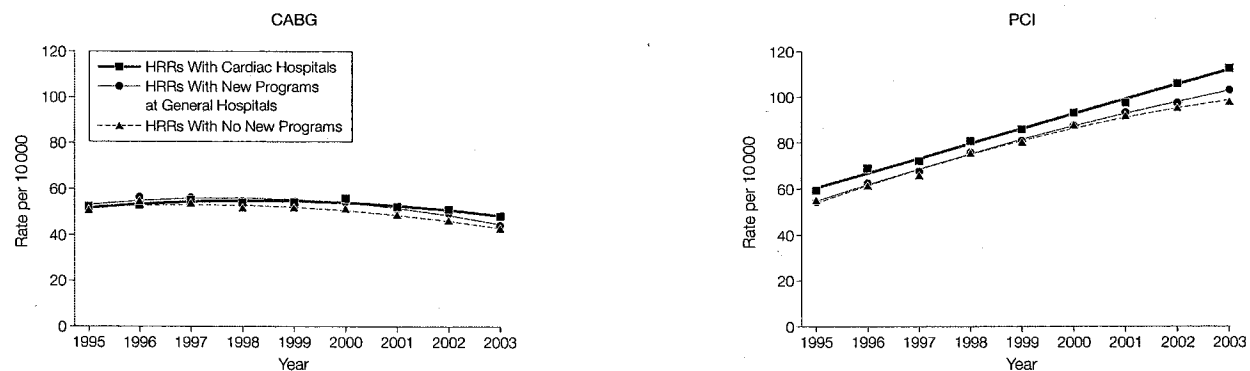
We also examined whether cardiac hospitals were selectively opening in already growing markets. Prior to their introduction, the rate of change for total revascularization was not significantly different in HRRs where cardiac hospitals opened than in HRRs where new cardiac programs opened at general hospitals (difference, +0.7/10 000 per year [95% CI, -0.8 to 2.2]; $P = .39$) or HRRs with no new programs (difference, +0.8/10 000 per year [95% CI, -0.5 to 2.0]; $P = .24$). Finally, we found that at the end of the study

Figure 1. Population-Based Rates of Total Revascularization by Year in Hospital Referral Regions (HRRs) With Cardiac Hospitals, HRRs With New Cardiac Programs at General Hospitals, and HRRs With No New Programs



Rates were adjusted for age, sex, and race using direct standardization. Trend lines were generated using fractional polynomial regression.

Figure 2. Population-Based Rates of Coronary Artery Bypass Graft (CABG) and Percutaneous Coronary Intervention (PCI) by Year in Hospital Referral Regions (HRRs) With Cardiac Hospitals, HRRs With New Cardiac Programs at General Hospitals, and HRRs With No New Programs



Rates were adjusted for age, sex, and race using direct standardization. Trend lines were generated using fractional polynomial regression.

period cardiac hospitals contributed substantially to the utilization of total revascularization within markets when compared with new cardiac programs at general hospitals. The mean procedural volume of cardiac hospitals in Medicare beneficiaries was 4-fold higher than that of new cardiac programs at general hospitals, while the percentage of coronary revascularizations within the HRRs that was performed at

cardiac hospitals was approximately 2-fold higher (TABLE 3).

COMMENT

We found that rates of change for total revascularization, CABG, and PCI were higher for Medicare beneficiaries in HRRs after the opening of cardiac hospitals when compared with HRRs where new cardiac programs opened at general hospitals and HRRs with no new

programs. The incremental number of coronary revascularizations in these 13 HRRs that was associated with the opening of cardiac hospitals was approximately 3032 between 1999 and 2003. Although we are unable to comment directly on the appropriateness of these procedures, these findings raise the concern that the opening of cardiac hospitals may lead to greater procedural utilization beyond the simple addi-

Table 2. Adjusted Rates of Coronary Revascularization per 10000 After the Opening of New Programs*

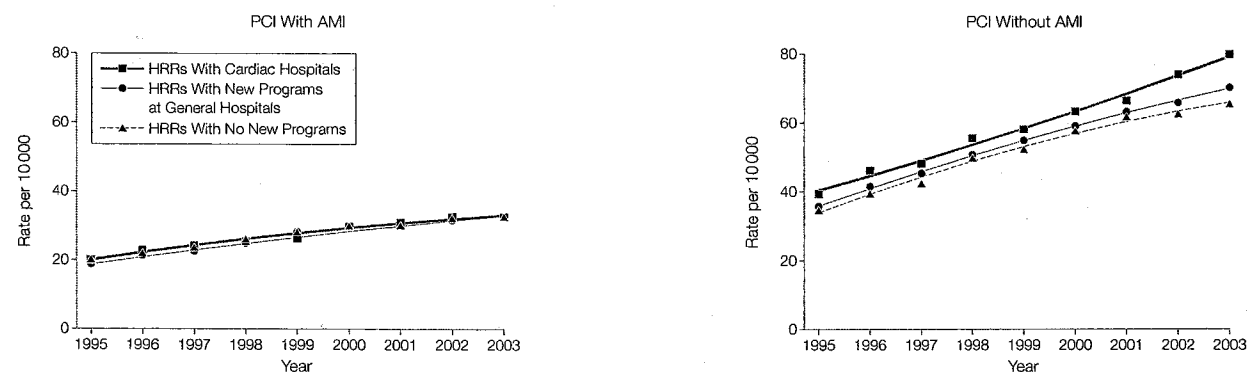
Type of Procedure	Rates Per 10 000 (SE)			% Change (95% CI)
	Baseline Year†	Year 2	Year 4	
Coronary revascularization				
HRRs with cardiac hospital	134.4 (5.5)	151.2 (7.0)	160.2 (9.0)	+19.2 (+6.1 to +32.2)
HRRs with new cardiac program at a general hospital	136.1 (2.4)	144.5 (2.3)	145.0 (2.3)	+6.5 (+3.2 to +9.9)
HRRs with no new program	132.8 (2.5)	141.6 (2.6)	142.6 (2.8)	+7.4 (+3.2 to +11.5)
CABG				
HRRs with cardiac hospital	51.6 (2.7)	52.4 (2.9)	49.6 (3.6)	-3.9 (-17.6 to +9.9)
HRRs with new cardiac program at a general hospital	54.4 (1.0)	51.0 (0.9)	44.1 (0.8)	-18.9 (-21.7 to -16.0)
HRRs with no new program	52.4 (0.8)	49.3 (0.8)	42.8 (1.0)	-18.3 (-22.1 to -14.5)
PCI				
HRRs with cardiac hospital	82.4 (4.0)	98.8 (4.9)	110.9 (6.2)	+34.6 (+19.8 to +49.4)
HRRs with new cardiac program at a general hospital	81.9 (2.0)	93.6 (2.0)	100.9 (2.1)	+23.2 (+18.2 to +28.2)
HRRs with no new program	80.5 (2.0)	92.1 (2.1)	99.4 (2.4)	+23.5 (+17.5 to +29.4)
PCI with AMI				
HRRs with cardiac hospital	27.0 (1.1)	29.4 (1.1)	31.2 (1.2)	+15.6 (+6.7 to +24.8)
HRRs with new cardiac program at a general hospital	26.8 (0.6)	29.9 (0.5)	32.5 (0.6)	+21.3 (+17.2 to +25.7)
HRRs with no new program	27.8 (0.6)	30.7 (0.5)	33.2 (0.7)	+19.4 (+14.7 to +23.7)
PCI without AMI				
HRRs with cardiac hospital	55.6 (3.6)	69.4 (4.6)	79.0 (5.9)	+42.1 (+21.4 to +62.9)
HRRs with new cardiac program at a general hospital	55.4 (1.7)	63.8 (1.7)	68.1 (1.8)	+22.9 (+16.4 to +29.2)
HRRs with no new program	52.9 (1.7)	61.5 (1.8)	66.0 (2.0)	+24.8 (+17.4 to +32.3)

Abbreviations: AMI, acute myocardial infarction; CABG, coronary artery bypass grafting; CI, confidence interval; HRRs, hospital referral regions; PCI, percutaneous coronary intervention.

*Adjusted for age, sex, race, US region, baseline year of 1999, presence of multiple new programs within the HRR, and mean socioeconomic status of the HRR.

†The baseline year of 1999 was used to reflect the midpoint of the study period when calculating the adjusted rates.

Figure 3. Population-Based Rates of Percutaneous Coronary Intervention (PCI) With and Without Acute Myocardial Infarction (AMI) by Year in Hospital Referral Regions (HRRs) With Cardiac Hospitals, HRRs With New Cardiac Programs at General Hospitals, and HRRs With No New Programs



Rates were adjusted for age, sex, and race using direct standardization. Trend lines were generated using fractional polynomial regression.

Table 3. Coronary Revascularizations Performed in Medicare Beneficiaries by Cardiac Hospitals and New Cardiac Programs at General Hospitals at the End of the Study Period (2003)

	Cardiac Hospitals		New Cardiac Programs	
	Coronary Revascularizations per Hospital, Mean (SD), No.	Coronary Revascularizations in the HRR Performed at Cardiac Hospitals, Mean (SD), %	Coronary Revascularizations per Hospital, Mean (SD), No.	Coronary Revascularizations in HRR Performed at New Cardiac Programs, Mean (SD), %
HRRs with cardiac hospitals	808.6 (370.5)	35.2 (20.2)	152.5 (143.0)	14.3 (14.2)
HRRs with new cardiac programs at general hospitals	NA	NA	161.1 (175.1)	18.0 (19.2)

Abbreviations: HRRs, hospital referral regions; NA, not applicable.

tion of capacity to a market. This is particularly worrisome since cardiac hospitals may not substantially improve clinical outcomes when compared with general hospitals with similar procedural volumes.¹⁰

An additional finding was that among patients with acute myocardial infarction, the subset of patients who are likely to gain the most clinically from PCI,^{20,21} there was no association between the opening of cardiac hospitals and the rate of change for PCI. The rate of change for PCI in patients without acute myocardial infarction, in contrast, was significantly higher in HRRs where cardiac hospitals opened. Although we could not assess appropriateness, the benefits of PCI are frequently less clear in this group of patients,²² suggesting that our findings may be partly driven by more discretionary cases. Finally, we found that cardiac hospitals had significantly higher procedural volumes than new cardiac programs at general hospitals and were responsible for more than twice the share of revascularizations within an HRR performed by the end of the study period.

Our findings differ somewhat from a recent study performed by the Medicare Payment Advisory Commission (MedPAC).^{23,24} In that study, HRRs where cardiac hospitals opened had a mixed association with utilization of CABG and PCI between 1996 and 2002. The likely explanation for the discrepancy between reports is that the MedPAC study did not account for the specific years that a specialty hospital was open. As a result, HRRs where cardiac hospitals opened in 2002 were considered the same as those that opened in 1997, although the former would be ex-

pected to only briefly affect utilization. A shorter study period also may have restricted the ability to detect potential associations. Another key difference between the 2 reports is that ours also examined rates of change in HRRs after the development of new cardiac programs at general hospitals. Distinguishing between the particular effect of cardiac hospitals and the mere addition of new cardiac programs at general hospitals is critical given recent growth in hospital-based services for coronary revascularization over the last decade.

Among potential mechanisms underlying our findings, the most concerning is the influence of physician ownership on decisions regarding the use of coronary revascularization. Self-referral of patients by physician owners to facilities where they have significant financial interest is generally prohibited by federal antikickback laws with the exception of "whole" hospitals.²⁵ Hospitals—including specialty hospitals—are exempted because they typically provide a diverse enough array of services so that physician owners are thought to gain little from self-referral. However, specialty hospitals are smaller and provide fewer services than general hospitals making them more analogous to departments within general hospitals, which are regulated by federal antikickback laws.²⁵

Our findings could also be explained by issues unrelated to physician ownership. Specialty hospitals may lead to higher utilization of these procedures through improved efficiencies in patient care that do not directly reflect financial incentives.

Cardiac hospitals might have opened in markets already predisposed to higher rates of coronary revascularization due to patient factors or local market conditions, although we found no direct evidence that this was occurring. Finally, anecdotal reports suggest that higher utilization of these procedures within a market may be due to general hospitals positioning themselves more aggressively after the opening of a specialty hospital.^{9,26} However, a national survey of 603 US hospitals by the General Accounting Office found little evidence this was occurring.²⁷

Our study should be interpreted with the following limitations in mind. First, this analysis cannot comment on the "correct" population-based rate for coronary revascularization. In fact, it may be that the opening of cardiac hospitals leads to more appropriate use of these procedures. Future studies will need to focus on this issue at both cardiac and general hospitals.

Second, in this type of analysis we are unable to fully attribute higher rates of coronary revascularization in HRRs where cardiac hospitals opened to these specific facilities. Instead, changes in the use of coronary revascularization after the opening of cardiac hospitals reflect the environment in which they and other competing hospitals exist. Our findings of higher procedural volumes at cardiac hospitals and their greater market share at the end of the study period are only suggestive of their role in higher rates of coronary revascularization.

Third, we were unable to evaluate the extent to which physician ownership at cardiac hospitals—which report-

edly ranges from 21% to 49%—influences utilization given a lack of publicly available information.²³ Fourth, data in this analysis were limited to Medicare beneficiaries (although this group does represent a majority of the patients undergoing coronary revascularization in the United States). Finally, we identified only 14 cardiac hospitals that opened during the study period. Although specialty hospitals have generated great controversy among policy makers, they are a relatively new phenomenon and important differences may exist across individual facilities. Expiration of the moratorium on new specialty hospital construction is expected to increase their numbers in the coming years.

Despite these limitations, our findings may have important policy implications. The CMS recently issued their final report to Congress implementing a strategic plan for specialty hospitals.¹³ Their plan primarily involves

revisions to the inpatient prospective payment systems to “level the playing field” between specialty and general hospitals and limit financial incentives for investing in certain services simply due to profitability. It also proposes new “gainsharing” and value-based payment approaches to better align physician and hospital incentives toward improving care at general hospitals. Reforms directly related to physician ownership include enhanced transparency of financial relationships. More stringent measures, such as limiting investments by physician owners, were not included. The extent to which additional measures are needed will require further data on appropriateness of care at specialty hospitals as well as the impact of greater utilization of these procedures on patient outcomes.

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Acquisition of data: Nallamothu, Birkmeyer.

Analysis and interpretation of data: Nallamothu, Rogers, Krumholz, Eagle, Birkmeyer.

Drafting of the manuscript: Nallamothu, Rogers.

Critical revision of the manuscript for important intellectual content: Nallamothu, Rogers, Chernew, Krumholz, Eagle, Birkmeyer.

Statistical analysis: Nallamothu, Rogers, Chernew.

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Physician-Owned Specialty Hospitals and Coronary Revascularization Utilization Too Much of a Good Thing?

Peter Cram, MD, MBA

Gary E. Rosenthal, MD

THE EMERGENCE OF SPECIALTY HOSPITALS THAT focus on lucrative procedural aspects of medicine has generated a heated debate among policy makers^{1,2} that largely involves 4 issues: patient selection (ie, "cherry-picking" of healthier and wealthier patients by specialty hospitals); quality of care in specialty and general hospitals; impact of specialty hospitals on the financial health of general hospitals; and influence of specialty hospitals on utilization and health care costs.

The debate intensified in 2003 with the passage of a temporary congressional moratorium (allowed to expire in 2005) on new specialty hospital construction. However, empirical data addressing the 4 issues remain limited. Consistent evidence suggests that specialty hospitals admit patients with lower acuity and fewer comorbidities than general hospitals.^{3,4} Studies assessing quality have found that risk-adjusted rates of adverse outcomes in specialty hospitals are similar or somewhat lower (perhaps 10%-20%) compared with general hospitals.^{5,6} While anecdotal reports about the negative influence of specialty hospitals on the financial health of general hospitals abound, limited data suggest that, thus far, the impact has been small.⁷

In this issue of JAMA, Nallamothu and colleagues⁸ provide intriguing new data suggesting that increases in the use of coronary revascularization were 2.5 to 3 times higher in health care markets that experienced entry of a new physician-owned specialty hospital compared with markets without specialty hospitals, including those markets in which new revascularization programs were established at general hospitals. The differences reflected a much lower decline in use of coronary artery bypass graft surgery and a larger increase in use of percutaneous coronary intervention (PCI). The increase in PCI was particularly striking among patients without acute myocardial infarction, a group for whom PCI may provide less benefit, but that accounted for more than two thirds of all PCI procedures.

One potential explanation for these findings is that utilization in markets with specialty cardiac hospitals reflects that astute investors chose to open specialty hospitals in mar-

kets that were already experiencing rapid growth in demand for revascularization. However, additional analyses conducted by the authors provided little support for this possibility. Alternatively, the growth in utilization in markets with new specialty hospitals may be directly attributable to procedures performed in the new specialty hospitals. Indeed, at the end of the observation period, in the study by Nallamothu et al, specialty hospitals had approximately twice the volume as new cardiac programs in general hospitals and accounted for more than a third of all revascularization procedures performed in their markets.

The current study would seem to support the hypothesis that specialty hospitals directly drive utilization of coronary revascularization. However, immediately drawing such a conclusion requires careful consideration and caution, particularly given the lack of direct information in the current study about the clinical appropriateness of procedures. Although new specialty hospitals may directly increase utilization by performing procedures for patients who might receive only marginal benefit from having interventions, it is also possible that specialty hospitals indirectly increase utilization by drawing patients away from existing general hospitals through competition. In turn, existing revascularization programs may respond to losses in patient volume with their own efforts to generate new business, further fueling utilization.

Even though it is not possible to dissect the fundamental drivers of utilization from the study by Nallamothu et al, or the influence of increased utilization on patient outcomes, the results need to be considered in light of 3 important issues currently confronting the US health care system. First, and perhaps most important, increasing evidence suggests a general lack of association between more aggressive management practices and greater health care expenditures and better patient outcomes at a population level.⁹ At the individual-patient level, the recently published Occluded Artery Trial (OAT) found that PCI performed more than 3 days following an acute myocardial infarction provided no benefits relative to medical therapy.¹⁰ Yet payment policies promoted by Medicare and other third-party payers have created large fi-

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See also p 962.

nancial incentives favoring procedural interventions over careful medical management and disease prevention.¹¹ These policies may change with the recently enacted update to the Medicare physician fee structure that will increase reimbursement for evaluation and management visits, while reducing reimbursement for many procedures, including PCI.¹²⁻¹³ Changes in the relative reimbursement for cognitive and procedural services and further refining of prospective payment to more equitably reimburse hospitals that care for more complex patients would likely mitigate the financial incentives driving specialty hospital growth. Nonetheless, potential drivers of physician interest in specialty hospitals, other than financial motivation, must be recognized, including a desire by physicians to gain greater control over hospital operations and quality,¹⁴ which, in turn, are related to the most fundamental issues of medical professionalism and physician job satisfaction.

Second, the study by Nallamothu et al must be considered in the context of the ongoing debate over the definition of what is (and what is not) a specialty hospital and the importance of physician ownership in this definition. Specialty hospitals have traditionally been identified as freestanding hospitals with unique Medicare billing numbers that focus on a discrete disease or set of procedures; the presence of unique Medicare billing numbers has been critical because it has allowed for easy identification of specialty hospitals using administrative data sources. Yet general hospitals are increasingly developing both "hospitals-within-hospitals" and freestanding single-specialty hospitals of their own that may not have unique Medicare billing numbers¹⁵ and may blur the distinction between specialty and general hospitals.

While Nallamothu et al focused exclusively on physician-owned specialty hospitals, which have been the primary source of public concern, not all specialty hospitals have physician owners.⁶ Even among physician-owned specialty hospitals, contractual relationships and governance are highly variable.³ Some hospitals are characterized by a small number of physician owners, each of whom owns a significant proportion of the hospital. Others are characterized by multiple physician owners who, even in aggregate, own a very small proportion of the overall hospital.

Third, the results of the study by Nallamothu et al should be considered in light of the data on physician- and hospital- (or supply-) induced demand. Physician ownership of ancillary services has been associated with overuse of these services, raising questions about whether physicians are placing their own financial interests ahead of their patients' best interests.¹⁶ This concern has provided the impetus for the federal ban on physician ownership of facilities such as pharmacies and home health agencies.¹⁷ The current findings raise important questions about the appropriateness of the "whole hospital" exemption loophole that permits physician ownership of specialty hospitals.

The emergence of specialty hospitals is in an early state of evolution but may represent the beginning of a funda-

mental reorganization in the ways in which hospitals are structured and care is delivered. Specialization already permeates most sectors of the US economy and is associated with both increased efficiency and product quality.¹⁸ Although there is no fundamental reason hospital care should differ, the current findings suggest that physician ownership of specialty hospitals may be problematic if such ownership increases the use of services for patients with marginal indications. As specialty hospitals evolve, vigilance will be needed to determine if benefits are being delivered as promised and if untoward effects on the delivery system are emerging. In the meantime, all hospitals will need to look carefully at specialty hospitals to see what, if any, lessons can be gleaned from their successes and failures.

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PERSPECTIVE

Hospitals And Physicians: Not A Pretty Picture

The existence of so many uninsured Americans is driving the dynamics pushing hospitals and physicians into an adversarial position.

by Jeff Goldsmith

ABSTRACT: Hospital-physician relationships in the United States have deteriorated markedly in the past few years. An asymmetry of obligations to caring for the uninsured and inappropriate financial incentives have worsened the conflict between hospitals and physicians in many markets. Sadly, the resources and political bandwidth consumed by managing this conflict have been diverted from the fundamental challenge of providing universal health coverage—the root cause of much of this conflict. [*Health Affairs* 26, no. 1 (2007): w72–w75 (published online 5 December 2006; 10.1377/hlthaff.26.1.w72)]

IN THEIR TIMELY analysis of the state of hospital-physician relations, Robert Berenson and colleagues provide a disturbing portrait of a rapidly unraveling relationship.¹ Generations of hospital executives and physicians have fought over the economic boundary between their respective economic spheres—the health system equivalent of the tide line between the Christian and Muslim worlds left by the collapse of the Ottoman Empire. As economic incentives in the payment system change, new conflicts have flared up along the border.

For two decades, hospitals have steadily lost share in lucrative ambulatory surgery and imaging markets to physician-sponsored enterprises, and there is evidence that the share loss has widened in the past two years.² Hospitals' share of overall health spending has fallen from almost 40 percent in 1980 to around 30 percent today.³

The widening rift between hospitals and physicians exposes the public to medical risks: inconsistent service quality, economically motivated and marginally necessary care, and dis-

parities in access to complex treatment depending on the patient's insurance status. Addressing the policy issues at the root of this split—flawed payment incentives, unfunded service mandates such as the Emergency Medical Treatment and Active Labor Act (EMTALA), hospital tax exemption, and safe harbors for physician-ownership of services and, at the root of many of them, the growing number of uninsured Americans—will grow in urgency as these conflicts deepen.

■ **Physicians' "hostage crisis."** Hospitals have less flexibility to respond to these pressures than their physician communities. EMTALA requires hospitals to provide emergency care to patients around the clock, regardless of their ability to pay, and to maintain access to physician services to support that care. There is no EMTALA obligation for physicians or the ambulatory facilities they own. The voluntary compact between hospitals and physicians whereby physicians, in exchange for hospital privileges, took emergency department (ED) call and provided backup for surgical and cardiac care after hours or on week-

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ends has devolved in many communities into a "hostage crisis," in which specialty physicians such as neurosurgeons, orthopedic surgeons, and cardiologists are demanding "extra-duty pay" in escalating amounts for care they used to provide hospitals for free.

Many of my hospital executive colleagues believe that physician stipends to cover the hospitals' twenty-four-hour services have become their most rapidly growing and least controllable expense, exceeding even their pharmacy cost growth. As hospitals grapple with this problem, they confront the beginning of what will become a wave of retirements of baby-boomer specialists and a scarcity of replacement physicians in specialties that have a 24/7 service demand (general surgery, cardiology, and so on).⁴ As specialty physicians become scarcer, their bargaining power with hospitals to demand pay for ED call coverage will increase.⁵

Physician care is increasingly becoming shift work. A new generation of physicians seems unwilling to surrender their private lives to more or less continuous medical practice, particularly as they see the human toll of wrecked marriages, overwhelming stress, and intraprofessional conflict that this practice style has produced among their older colleagues.⁶ It is an understandable and human reaction.

■ **New economic model.** Some physicians are exploiting the asymmetry of legal obligations and tightening physician markets to extract incomes that used to accrue from 100-hour work weeks while working much less. A new and deeply exploitative economic model of medical practice is emerging in some physician communities, particularly in the Sun Belt.

Components of this new economic model include "lecture fees," free travel, and other perks from drug companies to promote new drugs to physician colleagues; "consulting fees" from device manufacturers to use their

products exclusively; "partnership income" from physician-ownership in lucrative ambulatory facilities such as surgery and imaging centers, as well as in specialty hospitals that provide heart or orthopedic care; and "stipends" from hospitals for critical care coverage that physicians used to provide voluntarily.⁷

Most of these economic arrangements monetize the physician's ability to steer patients to particular therapies or clinical venues and are completely invisible to patients. In my

"Physicians' facilities-related 'partnership income' acts much as a turbocharger bolted onto the already inflationary engine of fee-for-service payment."

opinion, the recent explosive growth of elective procedures under Medicare Part B has been driven in major part by inappropriate economic incentives. Physicians' facilities-related "partnership income" acts much as a turbocharger bolted onto the already inflationary engine of fee-for-service payment. Berenson and colleagues could test this hypothesis by mapping this Part B cost trend onto their

twelve-community sample and observing whether communities with greater prevalence of physician-owned enterprises have higher Part B cost and volume growth.

Whatever its cause, volume growth in lucrative, high-intensity medical procedures is directly responsible for the recurring formula-driven reductions in physician fees under Part B, and results in a redistribution of wealth inside medical communities from primary care physicians to specialists, contravening the intent of resource-based relative value scale (RBRVS)-based physician payment reforms implemented in the early 1990s.⁸ The continuing cycle of Part B fee reductions and congressional rescissions cries out for a fundamental reexamination of Medicare's physician payment policies, and an urgent search for a successor to event-driven, fee-based payment.

Berenson and colleagues observe that in some communities, détente has been achieved or hospitals have begun employing physicians to cover their legal obligations, or both. In other communities, however, the smell of

moral rot and exploitation is almost overpowering. They correctly observe that "low leverage" physicians such as family practitioners and pediatricians, whose incomes have been falling, deeply resent the economically motivated behavior of their more fortunate specialty colleagues.⁹

■ **Desirable policy actions.** Berenson and colleagues identify some policy actions that could reduce economic conflicts between hospitals and physicians, such as eliminating Medicare "reimbursement windfalls" for some types of services, such as cardiac care. The recently neutered diagnosis-related group (DRG) recalibrations would have accomplished some of this, as have the major reductions in Medicare payment for free-standing imaging and office-based nuclear medicine procedures.¹⁰ They would also undercut the investment rationale for specialty hospitals and ambulatory facilities focused on these services. The emerging conflicts of interest in physician communities could also be addressed by strengthening prohibitions on cash or in-kind payments by pharmaceutical companies and device manufacturers to physicians for any reason, with strict limitations on consultative arrangements.

Berenson and colleagues provide excellent ammunition for those who would widen and brighten the "bright line" between physicians and ownership of the clinical services they direct. There is a compelling argument for ending the "whole hospital" exemption from Stark antikickback laws.¹¹ The "whole hospital" exemption will be responsible not only for a new generation of half-empty heart hospitals, but also the less visible trend of syndication to physician-ownership of marginally needed community hospitals, a costly alternative to simply closing them.¹² Physician support for new facilities should be based on their potential for quality and service improvements and on increased convenience to both patients and physicians, not the sound of coins dropping.

"Physician support for new facilities should be based on their potential for quality and service improvements, not the sound of coins dropping."

The real motivation of strengthening self-referral prohibitions is not, as some have recently argued, to protect the hospital's clinical franchises but, rather, to reinforce the increasingly questionable belief on the part of patients that physicians make clinical decisions based solely on the patient's best interests.¹³ Absent these policy changes, physicians should be required to disclose to patients both in their offices and on their Web sites both facility ownership and income support from device manufacturers, pharmaceutical firms, and hospitals, so that patients can draw their own conclusions about the motivations behind treatment decisions.

■ **Impact of widening coverage gap.** Tinkering with existing payment models and legal restrictions raises a larger question, however. The growing economic stress on hospitals, and growing tensions with physician communities, are in major part an artifact of the widening health insurance coverage gap. The number of uninsured Americans has grown by more than half since EMTALA was enacted in 1987.¹⁴

EMTALA would be unnecessary, and could be abolished, if we had universal health coverage, as would the host of subsidies (disproportionate-share hospital payments, critical-access subsidies, and so on) hospitals receive to compensate for coverage gaps. Universal coverage would also eliminate much of the rationale for hospital tax exemption.

Robert Clark has famously criticized hospital tax exemption as providing a screen for "for-profit" activities on the parts of their physicians, who make free use of the "community's" capital.¹⁵ Uwe Reinhardt argued recently for eliminating the hospital tax exemption but letting hospitals credit back against their tax liability the real cost of the community benefits they provide.¹⁶

The same conceptual approach that Reinhardt advocated for hospitals could be applied to physicians in the absence of universal

coverage—for example, providing tax credits in lieu of direct hospital payments for ED and intensive care unit (ICU) consultation and after-hours surgical call coverage, as well as office-based care provided to uninsured patients. Physicians could make voluntary decisions regarding their community service obligations and receive tax benefits in proportion to their effort. The higher their incomes, the more compelling the trade-off between tax credits for “voluntary” activity and taxable stipends from hospitals. Whether or not this would prove cheaper for the federal government than plowing the costs of the stipends into the base of hospital spending requires further analysis.

UNIVERSAL COVERAGE will not alleviate the impending physician shortages created by baby-boomer physician retirements, nor will it alter younger physicians’ desire for more manageable lifestyles. The tragedy is that both energy and dollars expended by policymakers trying to protect one or the other side in this increasingly bitter conflict are being diverted from the essential task of providing universal health coverage for Americans.

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Gazette Opinion: Red flags on specialty hospital development

On Friday, the Montana House Business and Labor Committee will hold a hearing on extending a moratorium on opening new specialty hospitals "exclusively engaged in" surgery or the diagnosis, care or treatment of cardiac, orthopedic or cancer conditions. Psychiatric, rehabilitation, children's care, long-term care and critical access hospitals are specifically excluded from the definition.

This distinction is being drawn, not just in Montana, but across the country because of recent development of hospitals (usually owned fully or partly by physicians) that specialize in the types of cases that are the most financially rewarding among the many services provided by general hospitals. Congress put the brakes on these new facilities because of cost concerns and worries about what may happen to the general service hospitals that communities count on to take care of all their needs 24/7, regardless of ability to pay. In Montana, all of the community hospitals are nonprofit organizations pledged to care for anyone who comes through their doors.

Two years ago, the Montana Legislature enacted a two-year moratorium on new specialty hospitals. It will sunset this June unless extended through Senate Bill 417, which drew strong bipartisan support in the Senate, passing on a vote of 39 to 11. Introduced by Sen. Roy Brown, R-Billings, the bill's 15 cosponsors include Sens. Kim Gillan and Lynda Moss and Wanda Grinde, all Billings Democrats, as well as Sen. Kelly Gebhardt and Rep. Alan Olson, both Roundup Republicans.

A companion bill, Senate Joint Resolution 15, introduced by Gillan and Brown, requests an interim study on how physician-owned health-care facilities and specialty hospitals would affect Montana's health system. Together, SB417 and SJR15 would give Montana two years and better information for making decisions in 2009.

Meanwhile in Washington, D.C., specialty hospitals face an uphill battle. The new chairman of the Senate Finance Committee, Max Baucus of Montana, had this to say last week: "My strongly held view on doctor-owned specialty hospitals is that they undermine the basic system." Baucus told The Gazette that specialty hospitals tend to increase costs and to decrease access for all to health care. He predicted "there will be opportunities to pass legislation to stop these specialty hospitals." The ranking minority member of the Finance Committee, Sen. Charles Grassley, R-Iowa, agrees with Baucus. In the House, Ways and Means Committee Chairman Rep. Pete Stark, D-Calif., has long taken a hard line against letting doctors refer Medicare patients to facilities in which the doctors are investors.

There are between 130 and 140 specialty hospitals in the United States, almost all developed before a 2003 federal ban took effect, according to the Congressional Quarterly Weekly. In the six months since the ban expired, at least 30 new specialty hospitals have broken ground. Congressional Quarterly Weekly also reported last month that high costs have prompted some private insurers to refuse to admit specialty hospitals to their networks.

At a U.S. Senate hearing last year, Baucus noted that the General Accountability Office found that, in the aggregate, specialty hospitals had little effect on the survival of full-service community hospitals. But the Medicare Payment Advisory Commission found that specialty hospitals are more expensive than full-service hospitals and the nonpartisan Congressional Budget Office also believes that specialty hospitals drive up health costs.

Perhaps, there are circumstances in which stand-alone cardiac or orthopedic hospitals will benefit Montana communities. But there are enough red flags about these new hospitals to warrant a cautious approach to protect the fragile safety net that cares for all Montanans. The Montana House committee should add its endorsement to the the Senate's and urge the full House to send SB417 and SJR15 to Gov. Brian Schweitzer for his signature.

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AUGUST 2006

REPORT TO THE CONGRESS

**Physician-Owned
Specialty Hospitals
Revisited**

MEDPAC Medicare
Payment Advisory
Commission

AUGUST 2006

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Executive summary

Executive summary

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) required that MedPAC investigate several aspects of physician-owned specialty hospitals. We fulfilled this mandate with our March 2005 specialty hospital report. In that report we found that:

- Physician-owned specialty hospitals (specialty hospitals) did not have lower costs per severity-adjusted discharge than competitor community hospitals in their markets, although their patients had shorter lengths of stay.
- Specialty hospitals generally admitted less severe cases (which are expected to be more profitable) and concentrated on particular diagnosis-related groups (some of which were expected to be relatively more profitable than the average).
- Specialty hospitals tended to have lower shares of Medicaid patients than competitor community hospitals.
- Specialty hospitals drew patients from community hospitals, resulting in a small reduction in Medicare revenue growth. However, the financial impact on competitor community hospitals was limited because these hospitals took steps to compensate for lost revenue growth. Competitor community hospitals have had profit margins that are comparable to those of community hospitals located in markets without physician-owned specialty hospitals.
- From 1996 to 2002, cardiac surgeries per capita grew 4 percent faster in markets that gained a physician-owned heart hospital than in other markets. However, the 4 percentage point difference in growth rates was not statistically significant. The heart hospital markets also had a higher than expected rate of coronary artery bypass graft (CABG) surgery. The association between physician-owned cardiac hospitals and changes in the rate of CABG surgery per capita through 2002 was statistically significant.

However, the report also stressed that our findings could change as specialty hospitals evolve and capture a larger share of the market for hospital services. The 2005 report was based on the limited set of specialty hospitals that were operating for all of 2002. Our 2005 report and this report do not evaluate the quality of care in physician-owned specialty hospitals. Congress mandated that the Centers for Medicare & Medicaid Services (CMS) address that issue (CMS 2005).

After we presented the results from our March 2005 report, members of the congressional committees with jurisdiction over Medicare asked us to do some follow-up work when more data were available. The purpose of this paper is to update our analysis of physician-owned hospitals using two additional years of data (2003 and 2004) from an expanded set of specialty hospitals. We use the expanded data set to reexamine specialty hospitals' cost of inpatient care, Medicaid

share, impact on competitor community hospitals, and whether market entry of physician-owned heart hospitals is associated with an increase in cardiac surgeries.

In general, our findings are similar to our earlier work; however, the statistical significance of some findings has increased due to having a larger number of specialty hospitals to examine. Specifically we find:

- The number of physician-owned specialty hospitals roughly doubled from 2002 to 2004. Specialty hospitals continue to locate in areas that lack certificate-of-need laws and have above average population growth.
- The median heart hospital has 56 beds and a strong focus on Medicare inpatient services.
- The median orthopedic/surgical hospital has 14 beds, focuses on outpatient services, and receives a majority of its revenue from private payers.
- Both types of physician-owned hospitals tend to have lower shares of Medicaid patients than local competitors and nonlocal peer hospitals that specialize in cardiac or orthopedic care.
 - Medicaid patients represented 3 percent of discharges at the median physician-owned heart hospital and 2 percent at the median physician-owned orthopedic and surgical hospital. The median competitor community hospitals in those markets had a 13 percent Medicaid share. Competitor community hospitals may attract a larger share of Medicaid patients primarily because they offer a different set of services including obstetrics.
 - In an effort to control for service mix, we also compared physician-owned specialty hospitals to peer hospitals (hospitals with similar levels of specialization that are not physician owned). The median peer heart hospitals had a 7 percent Medicaid share, and the median peer orthopedic/surgical hospital had a 3 percent Medicaid share. The Government Accountability Office (GAO) found similar differences in their analysis of Medicaid shares.
- Specialty hospitals' inpatient services are not less costly than community hospitals' services, as might be expected from a "focused factory" hypothesis. But they do have some competitive advantages, such as shorter lengths of stay.
 - Heart hospitals have inpatient costs per discharge that are comparable to those of competitor community hospitals.
 - Orthopedic/surgical hospitals tend to have inpatient costs per discharge that are about 20 percent higher than those of competitor community hospitals. The difference in costs is statistically significant.

- Both groups of specialty hospitals have 20 percent to 25 percent shorter lengths of stay than competitor community hospitals, and the difference is statistically significant.
- However, the potential savings from shorter stays are not sufficient to offset the effects of other factors on orthopedic/surgical hospitals' costs.
 - Some of the higher costs per discharge at physician-owned orthopedic/surgical hospitals are due to low inpatient volume and higher unused capacity (medians of 14 beds and 28 percent occupancy).
 - Higher levels of depreciation and lease expenses per discharge may explain a small share of the higher costs at orthopedic/surgical hospitals.
- Physician-owned heart hospitals were associated with a statistically significant increase in the rate of cardiac surgeries in the market area.
 - For a typical market, we estimate that entrance of a physician-owned cardiac hospital was associated with a 6 percent increase in the number of cardiac surgeries per 1,000 Medicare beneficiaries (confidence interval 1 percent to 11 percent).
 - The typical heart hospital had 26 percent of the cardiac surgery market in 2004 and obtained most of its market share (roughly 20 of the 26 percentage points) by diverting patients from competitor community hospitals.
 - As was the case with our analysis of 2002 data, heart hospital markets had more CABG surgeries per 1,000 Medicare beneficiaries than would have been expected given the market's historical experience and national trends. Our model estimates that the entrance of a physician-owned hospital into a market is associated with a 9 percent increase in the number of CABG surgeries (confidence interval 1 percent to 18 percent) over the rate per 1,000 beneficiaries that would have been expected in the absence of the heart hospital.
 - We also categorized cardiac surgery patients into relatively high- and low-profit cases. Physician-owned hospitals did not have a significantly larger effect on the volume of relatively high-profit surgeries (low-severity patients) than they had on historically less profitable surgeries (high-severity patients) in the market.
 - Taken together these findings—an increase in overall surgeries, but no material shift in the ratio of high-severity to low-severity surgeries—are consistent with more than one hypothesis. One hypothesis is that physicians have a financial incentive to invest in cardiac hospitals, and these new specialty hospitals result in more surgical capacity and hence more surgeries per capita. Alternatively, individual physicians' clinical decision making is directly affected by financial incentives, but the change is a broad shift toward more surgeries rather than a precise shift toward the most profitable surgeries.

- While the specialty hospitals took profitable surgical patients from the competitor community hospitals (slowing Medicare revenue growth at some hospitals), most competitor community hospitals appeared to compensate for this lost revenue. From our site visits in 2004, we learned that in some cases competitor community hospitals cut expenses by cutting staff; in some cases they instituted “aggressive pricing strategies” to raise revenue from private payers; and in many cases they expanded profitable business lines such as imaging, rehabilitation, pain management, cardiology, and neurosurgery. These responses to the specialty hospital challenge coupled with population growth in many of the markets where specialty hospitals operate combined to allow competitor community hospitals to maintain profit margins that are in line with national averages.

As physician-owned entities capture more profitable service lines, the effect on community hospitals may increase. However, we found that community hospitals’ profit margins appeared stable through 2004, even in markets where physician-owned hospitals captured more than 10 percent of all admissions.

**Physician-owned
specialty hospitals revisited**

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) required that MedPAC investigate several aspects of physician-owned specialty hospitals. We fulfilled this mandate with our March 2005 specialty hospital report. However, that initial report was limited to examining hospitals that were operating by 2002, and we stressed that our findings could change as specialty hospitals evolve and capture a larger share of the market for hospital services.

After we presented the results from our March 2005 report, members of the congressional committees with jurisdiction over Medicare asked us to do some follow-up work when more data were available. The purpose of this paper is to update our analysis of physician-owned hospitals using two additional years of data (2003 and 2004) from an expanded set of specialty hospitals. We use the expanded data set to reexamine specialty hospitals' cost of inpatient care, Medicaid share, and impact on competitor community hospitals. We also look at whether market entry of physician-owned heart hospitals is associated with an increase in cardiac surgeries.

Characteristics of physician-owned specialty hospitals

The number of physician-owned hospitals almost doubled from 2002 to 2004. Heart hospitals have a strong focus on inpatient services for Medicare patients, and orthopedic/surgical hospitals tend to focus on outpatient care for private payers. Both types of physician-owned hospitals tend to have slightly lower Medicaid shares than specialized hospitals that are not physician owned.

Methodology

We identified hospitals' specializations by examining Medicare discharge data for fiscal year 2004. Hospitals were deemed specialized if at least 45 percent of their discharges were in one area of specialization or 66 percent were in two areas of specialization. We also limited our population to hospitals with at least 25 Medicare discharges. Physician ownership was identified through telephone surveys conducted during 2004 and 2005.¹ Our specialty hospitals are divided into the following three categories:

- *Heart hospitals:* Cardiac discharges represent 45 percent or more of Medicare discharges in either 2002 or 2004. In addition, the hospital performs angioplasty and bypass surgery.
- *Orthopedic hospitals:* Orthopedic discharges represent 45 percent or more of Medicare discharges or represent 66 percent of Medicare cases when combined with other surgeries or cardiac cases in either 2002 or 2004.
- *Surgical hospitals:* Surgical cases (other than orthopedic and cardiac surgeries) represent over 45 percent of all Medicare discharges or 66 percent of the cases when combined with orthopedic or cardiac cases in either 2002 or 2004. The surgical category excludes hospitals focusing on obstetrics.²

Table 1**Number of physician-owned specialty hospitals nearly doubles**

Type of physician-owned specialty hospital	In 2002 data set	Added to 2004 data set	Total in 2004
Cardiac	12	13	25
Orthopedic	27	26	53
Surgical	7	4	11
Total	46	43	89

Note: The set does not represent all physician-owned specialty hospitals. Some orthopedic or surgical hospitals may have fewer than 25 Medicare cases. The set also excludes hospitals focusing on obstetrics.

Source: MedPAC survey of specialty hospitals.

Using the above criteria, our population of physician-owned specialty hospitals consists of 46 hospitals from our prior study that met our criteria in 2002, and 43 additional hospitals that met our criteria in 2004 (Table 1). Most of the 43 hospitals that qualified in 2004 first entered the market in 2003 or 2004. Due to the similarity of orthopedic and surgical hospitals, we combined them into one category (with 64 hospitals in total) for all of our analyses.

Categories of hospitals

As in our earlier study, we compared our physician-owned hospitals to two types of hospitals. The first category is “peer” hospitals, defined as hospitals that met the specialization criteria (heart or orthopedic/surgical), but were not physician-owned. They usually operate in markets without physician-owned hospitals. We identified 25 peer heart hospitals and 16 peer orthopedic/surgical hospitals with complete cost report information. The peer group is compared to physician-owned hospitals so we can better distinguish the effect of specialization from the effect of physician ownership.

The second category is “competitor community” hospitals. We used this category of hospitals to compare physician-owned hospitals to community hospitals in the same markets and to see how physician-owned hospitals affect the financial condition of their local competitors. A hospital is deemed to be a “heart competitor” if it had at least 10 Medicare bypass or angioplasty surgeries in 2004 and is located in the same cardiac surgery market as a physician-owned heart hospital. A hospital is deemed to be an “orthopedic/surgical competitor” if it is in the same general surgery market and had at least 5 Medicare surgical cases in 2004. We identified 148 “heart competitors” and 300 “orthopedic/surgical competitors.”

The markets for cardiac surgery are defined using the 306 Dartmouth Atlas of Healthcare hospital referral regions (HRRs) (Wennberg 1999). The HRRs were developed by looking at travel patterns of Medicare beneficiaries who received cardiac surgery. The markets for orthopedic/surgical hospitals are defined using the 803 hospital service areas (HSAs) for routine

Medicare services as determined by Makuc and colleagues (1991).³ We use two different market areas because patients often travel farther for a cardiovascular surgery than for general surgery, which is available in more hospitals.

Characteristics of specialty, peer, and competitor community hospitals

The specialty hospitals that formed during 2002 through 2004 have very similar characteristics to older specialty hospitals. In general, heart hospitals are focused on serving Medicare patients and generate most of their revenue from inpatient services (Table 2). In contrast, the orthopedic/surgical hospitals gain most of their revenue from private payers and tend to focus on outpatient

Table 2

Median characteristics of heart hospitals

Characteristics	Heart specialization		Competitor community hospitals
	Physician-owned hospitals	Peer community hospitals	
Number of hospitals	20	25	148
Number of beds	56	322	216
Annual admissions	3,638	17,503	12,020
Occupancy	66%	72%	65%
Inpatient charges as a percent of total charges	79%	75%	65%
Medicare share of discharges	63%	45%	37%
Medicaid share of discharges	3%	7%	13%
Building and equipment book value* (millions)	\$33	\$109	\$81
Total revenue (millions)	\$59	\$262	\$175
Median total margin	7%	5%	5%
Return on invested capital**	13%	5%	5%
Number of physician investors	36	N/A	N/A
Ownership share per physician	1%	N/A	N/A
Hospital income per physician investor	\$40,000	N/A	N/A

Note: N/A (not applicable). Peer hospitals have a similar concentration to specialty hospitals, but are not physician-owned. Competitors include all hospitals in the hospital referral region offering similar [cardiac] services.

* Book value is the purchase price less accumulated depreciation.

**Return on invested capital is income plus interest expense divided by total assets and measures average return on the equity and debt invested in a hospital.

Source: MedPAC analysis of survey and 2004 cost report data for hospitals open for a full year in 2004.

Table 3**Median characteristics of orthopedic/surgical hospitals**

Characteristics	Orthopedic or surgical specialization		Competitor community hospitals
	Physician-owned hospitals	Peer community hospitals	
Number of hospitals	58	16	298
Number of beds	14	84	173
Annual admissions	649	3,150	8,758
Occupancy	28%	36%	60%
Inpatient charges as a percent of total charges	32%	58%	62%
Medicare share of discharges	33%	36%	36%
Medicaid share of discharges	2%	3%	13%
Building and equipment book value* (millions)	\$5	\$38	\$53
Total revenue (millions)	\$17	\$67	\$108
Median total margin	12%	9%	4%
Return on invested capital**	34%	8%	5%
Number of physician investors	25	N/A	N/A
Ownership share per physician	3%	N/A	N/A
Hospital income per physician investor	\$50,000	N/A	N/A

Note: N/A (not applicable). Peer hospitals have a similar concentration to specialty hospitals, but are not physician-owned. Competitor community hospitals include 298 of the 300 hospitals in the health service areas offering orthopedic/surgical services. We are missing data on two competitor community hospitals.

* Book value is the purchase price less accumulated depreciation.

**Return on invested capital is income plus interest expense divided by total assets and measures average return on the equity and debt invested in a hospital.

Source: MedPAC survey of hospitals and analysis of 2004 cost report data for hospitals open for a full year in 2004.

services (Table 3). Both types of specialty hospitals tend to have above average total profit margins and yield higher returns on invested capital than competitor community hospitals. While some specialty hospitals are unprofitable, the unprofitable hospitals are often either newer facilities or facilities with relatively low patient volumes.

Interviews with physician investors during our earlier site visits suggest that physicians will continue to be interested in investing in hospitals to (1) increase operating room capacity in their market to provide them with more desirable operating room scheduling, (2) gain more control over their workplace, and (3) obtain the attractive returns on capital—especially from orthopedic/surgical hospitals—which often require modest investments in fixed assets.

Physician-owned hospitals tend to have low Medicaid shares

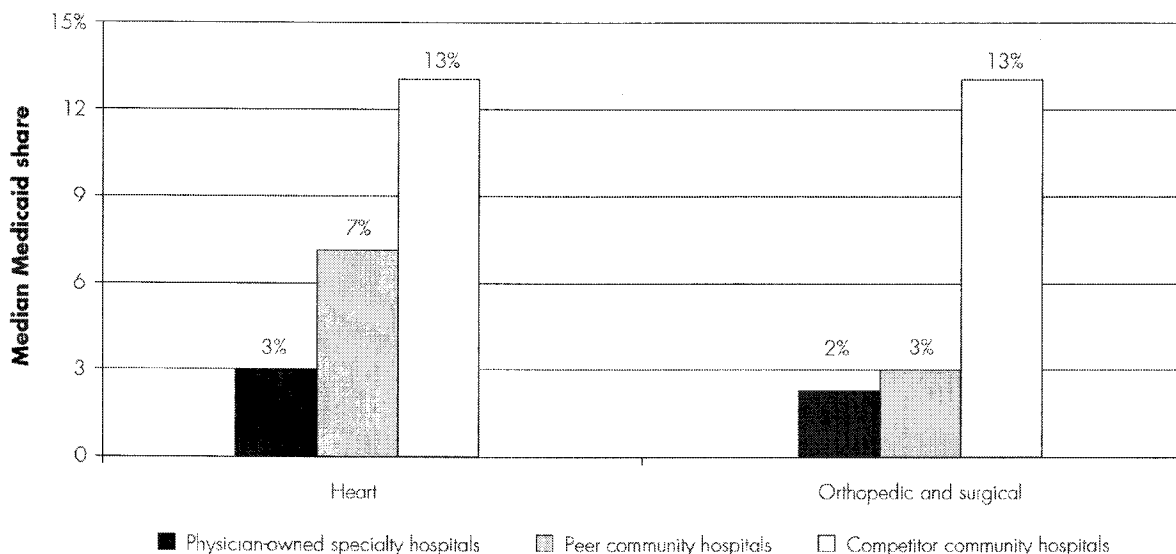
As we discussed in our March 2005 report, many factors can influence a hospital's Medicaid share including location, type of services offered, mission, Medicaid managed care contracts, and type of referral relationships with primary care physicians. For example, hospitals with obstetrics departments tend to serve more Medicaid patients. This could partially explain why Medicaid patients represent 13 percent of competitor community hospital patients, 3 percent of heart hospital patients, and 2 percent of orthopedic/surgical hospital patients (Figure 1).

To control for differences in service offerings, we compared physician-owned hospitals to peers that are focused on a similar set of services. We found that peer heart hospitals had a 7 percent inpatient Medicaid share (compared to 3 percent at physician-owned heart hospitals). Peer orthopedic and surgical hospitals had a 3 percent inpatient Medicaid share (compared to 2 percent at physician-owned orthopedic/surgical hospitals). It should be noted that Medicaid shares vary widely among orthopedic peer hospitals. For example, some orthopedic/surgical peer hospitals had an inpatient mix that was less than 1 percent Medicaid, while two larger orthopedic/surgical peers had an inpatient mix that was over 10 percent Medicaid.

The Government Accountability Office (GAO) had similar findings, although their approach was different. They examined specific types of discharges (e.g., cardiac) at physician-owned hospitals and competitor community hospitals in their markets. Among cardiac discharges in

Figure 1

Physician-owned hospitals have a lower median Medicaid share



Note: For all 3,342 community hospitals in our data set, the median Medicaid share was 13 percent.

Source: Medicare cost reports and survey data for hospitals open one full year in FY 2004.

six states, Medicaid discharges represented 3 percent of the cardiac discharges at heart hospitals and 6 percent of the cardiac discharges at community hospitals in those markets (GAO 2003). The GAO findings and our findings both suggest that specialization does not fully account for physician-owned hospitals' low Medicaid shares. Other specialty hospital decisions such as location, mission, emergency room capability, and physician financial incentives to avoid Medicaid patients may have contributed to the lower Medicaid shares at physician-owned hospitals.

Do physician-owned hospitals have lower costs per discharge?

In the Commission's earlier study of 2002 data, we found that heart and orthopedic/surgical specialty hospitals had higher inpatient costs per discharge than the corresponding values for competitor community hospitals. The cost differences, however, were not statistically significant. We noted that this finding was based on data for a small number of specialty hospitals that had not been operating for long, and their relative costs could change as they matured and expanded their patient volume.

In this updated analysis, we again find that orthopedic/surgical hospitals have higher inpatient costs than competitor community hospitals. In this larger sample of orthopedic/surgical hospitals the difference is statistically significant. The higher costs are associated with a lack of inpatient economies of scale and low occupancy at orthopedic/surgical hospitals. Heart hospitals have inpatient costs similar to those of their local competitors. Taken together, our inpatient cost findings are inconsistent with the hypothesis that hospitals specializing in a narrow range of clinical practice—focused factories—are less costly than traditional full-service community hospitals.⁴

Updated methodology

To revisit this issue, we examined Medicare inpatient costs per discharge reported in hospitals' Medicare cost reports for fiscal year 2004. As we did in our earlier analysis of 2002 data, we also compared hospitals' lengths of stay (LOS) for Medicare claims reported in the fiscal year 2004 Medicare Provider Analysis and Review (MedPAR) file, controlling for differences in case-mix severity and regional LOS patterns.

In the 2004 data, we now have two groups of specialty hospitals. Some opened prior to 2002 and have been operating for three or more years, while others opened after the start of 2002 and thus have been operating for only one or two full years. We took the opportunity to examine whether hospitals that have been open for one to two years have a different experience than those that have been open longer. However, we excluded hospitals that were open for less than a full year because they generally had very high costs due to low occupancy in their startup phase of operation.

We standardized hospitals' reported inpatient costs to remove the effects of factors that could confound our evaluation of cost per discharge at physician-owned specialty hospitals and their comparison groups (peer hospitals and competitor community hospitals). These factors include local input price levels, case-mix severity, prevalence of short-stay transfers, prevalence of high-cost outliers, extent of teaching activity, and share of low-income patients (although this effect is very small). We also equalized interest expenses per discharge across all hospitals to remove differences in reported capital costs that reflect hospitals' financing choices rather than real differences in resource use. We did not make this adjustment in our earlier comparison of 2002 costs per discharge. To further ensure comparability, we excluded 6 of the 25 heart specialty hospitals, 8 of the 63 orthopedic/surgical hospitals, and a few peer and competitor community hospitals from the analysis because they were open for less than a full year in 2004 or their estimated inpatient cost per discharge or outlier prevalence was obviously implausible.

Heart specialty hospitals, peers, and competitors have similar inpatient costs

After controlling for the cost factors outlined above, heart specialty hospitals had moderately higher mean costs per discharge (108 percent) than peer hospitals and local competitors (Table 4, p. 10). The differences in mean costs, however, were primarily due to high costs at a few low-volume providers, and were not statistically significant. When we weighted hospitals' costs by their case volumes, the heart hospitals did not have any higher costs than competitor community hospitals. Consequently, we conclude that heart specialty hospitals have costs that are similar to those in competitor community hospitals. We also examined differences between older and newer heart hospitals. We found little difference in costs per discharge between those that opened after 2002 and those that have been open for a longer period.

Orthopedic/surgical specialty hospitals have significantly higher inpatient costs

After adjusting for the same cost factors, orthopedic/surgical specialty hospitals appear to have inpatient costs that are 20 percent to 30 percent higher than costs at competitor community hospitals (Table 5, p. 11). It is possible that orthopedic/surgical hospitals do become more efficient over time. However, even among hospitals that were open at least two full years, adjusted inpatient costs per discharge were 117 percent of the national average.

Length of stay

As we did in our analysis of 2002 LOS data, we controlled for differences in the mix of cases treated among hospitals using the severity of illness classes of the all patient refined diagnosis related groups (APR-DRGs). Because average length of stay varies by region, we compared each specialty hospital's LOS to the LOS pattern within that hospital's region.

Table 4

Standardized costs per discharge in physician-owned heart hospitals are similar to those of other hospitals

Hospital group	Number of hospitals	Average costs compared with national, 2004	
		Case weighted	Simple mean
All IPPS hospitals	3,386	100%	101%
All operating in 2004			
Physician-owned heart	19	100	108
Peer	25	100	99
Competitor community	147	102	100
All other	3,195	100	101
Operating in 2002 and 2004			
Physician-owned heart	11	99	107
Entered market after 2002			
Physician-owned heart	8	102	108

Note: IPPS (inpatient prospective payment system). Excludes hospitals open for less than one year and those with missing or erroneous cost data. None of the differences in standardized cost per discharge among heart specialty, peer, competitor community, or other hospitals are statistically significant in a Tukey mean separation test with a criterion value of 0.05. Costs are standardized for differences in case-mix severity, prevalence of short-stay transfers, prevalence of high-cost outliers, local input prices, the effects of training residents, share of low-income patients, and differences in interest expenses per discharge. Percent of national values are based on national amounts for all U.S. nonspecialty hospitals paid under the inpatient prospective payment system. Competitor hospitals are specialized, but are not physician owned. Competitor community hospitals are in the same market as specialty hospitals and provide similar services. The all other hospital groups include all hospitals except the particular specialty, peer, and competitor community hospitals.

Source: MedPAC analysis of Medicare hospital cost data and 11 million inpatient claims for fiscal year 2004 from CMS.

Our 2004 data set yields findings that mirror our 2002 findings. Controlling for the type of patient admitted, specialty hospitals keep patients for significantly shorter stays than peer, competitor community, and all other hospitals (Table 6, p. 12, and Table 7, p. 13). Average lengths of stay were 24 percent to 28 percent shorter than expected in heart specialty hospitals and 20 percent to 23 percent shorter than expected in specialty orthopedic/surgical hospitals. This holds for new and older specialty hospitals.

Why are specialty hospitals' costs not lower?

Specialty hospitals' lengths of stay were significantly shorter than those in peer and competitor community hospitals. Yet heart specialty hospitals had roughly average costs and specialty

Table 5

**Standardized costs per discharge in
physician-owned orthopedic/surgical hospitals
are higher than those of other hospitals**

Hospital group	Number of hospitals	Average costs compared with national, 2004	
		Case weighted	Simple mean
All IPPS hospitals	3,386	100%	101%
All operating in 2004			
Physician-owned orthopedic/surgical	55	120	131 *
Peer	15	109	118
Competitor community	300	101	100
All other	3,016	100	100
Operating in 2002 and 2004			
Physician-owned orthopedic/surgical	33	114	117 *
Entered market after 2002			
Physician-owned orthopedic/surgical	22	135	152 **

Note: Excludes hospitals open for less than one year and those with missing or erroneous cost data. Costs are standardized for differences in case-mix severity, prevalence of short-stay transfers, prevalence of high-cost outliers, local input prices, the effects of training residents, share of low-income patients, and differences in interest expenses per discharge. Percent of national values are based on national amounts for all U.S. nonspecialty hospitals paid under the inpatient prospective payment system. Peer hospitals are specialized, but are not physician owned. Competitor community hospitals are in the same market as specialty hospitals and provide similar services. The all other hospital groups include all hospitals except the particular specialty, peer, and competitor community hospitals.

*Standardized cost per discharge is significantly higher compared with both competitors and all other hospitals, but not peer, in a Tukey mean separation test with a criterion value of 0.05.

**Standardized cost per discharge is significantly higher compared with peers, competitors and all other hospitals in a Tukey mean separation test, with a criterion value of 0.05.

Source: MedPAC analysis of Medicare hospital cost data and 11 million inpatient claims for fiscal year 2004 from CMS.

orthopedic/surgical hospitals had significantly higher costs than their competitors. Shorter stays should lead to lower costs, but we found equal or higher inpatient costs at specialty hospitals.

The cost differences we see may reflect a variety of factors, including high depreciation and lease expenses, different staffing levels or employee compensation, and greater supply costs because of specialty hospitals' focus on surgeries as opposed to medical care. In the case of some cardiac hospitals, high capital costs may reflect their decision to build only single occupancy rooms that are equipped for intensive care. In the case of orthopedic/surgical hospitals, their high capital costs could partly reflect their small scale and low occupancy. Differences in interest expenses should not affect our findings because we adjusted for them.

Table 6

Length of stay in physician-owned heart hospitals is shorter than that of other hospitals

Hospital group	Number of hospitals	Length of stay (in days)		Ratio of actual to expected length of stay
		Actual	Expected	
All IPPS hospitals	3,386	5.5	5.5	1.00
All operating in 2004				
Physician-owned heart	19	3.5	4.6	.76*
Peer	25	5.9	5.7	1.03
Competitor community	147	5.5	5.4	1.01
All other	3,195	5.5	5.5	1.00
Operating in 2002 and 2004				
Physician-owned heart	11	3.6	4.6	.79*
Entered market after 2002				
Physician-owned heart	8	3.4	4.7	.72*

Note: Excludes hospitals open for less than one year and those with missing or erroneous cost data. Expected length of stay is the weighted average of the regional average lengths of stay for all inpatient prospective payment system hospitals in each all patient refined diagnosis related group and severity class, weighted by the specialty hospitals' mix of cases among the same categories. Peer hospitals are specialized, but are not physician owned. Competitor community hospitals are in the same market as specialty hospitals and provide some similar services. The "all other" hospital groups include all hospitals except the particular specialty, peer, and competitor community hospitals.

*The ratio of actual to expected length of stay is significantly lower (actual lengths of stay are shorter than expected) than for peer, competitor community, and all other hospitals in a Tukey mean separation test with a criterion value of 0.05.

Source: MedPAC analysis of 11 million Medicare hospital claims for fiscal year 2004 from CMS.

Low volume and unused capacity

Heart specialty hospitals often have over 3,000 admissions per year and often have about the same levels of unused inpatient capacity as their peers and competitors. Their costs are comparable to competitor community hospitals. Orthopedic/surgical hospitals, however, are typically much smaller (a median of 14 beds) and operate with a large percentage of unused inpatient capacity (28 percent occupancy). These facilities are primarily focused on outpatient procedures, as indicated by the low share of their total charges that comes from inpatient services (median value of 32 percent). Together, the low inpatient volume and unused capacity of

Table 7

Length of stay in physician-owned orthopedic/surgical hospitals is shorter than that of other hospitals

Hospital group	Number of hospitals	Length of stay (in days)		Ratio of actual to expected length of stay
		Actual	Expected	
All IPPS hospitals	3,386	5.5	5.5	1.00
All operating in 2004				
Physician-owned orthopedic/surgical	55	2.9	3.7	.79*
Peer	15	4.9	4.8	1.02
Competitor community	300	5.4	5.4	1.00
All other	3,016	5.5	5.5	1.00
Operating in 2002 and 2004				
Physician-owned orthopedic/surgical	33	3.0	3.7	.80*
Entered market after 2002				
Physician-owned orthopedic/surgical	22	2.7	3.5	.77*

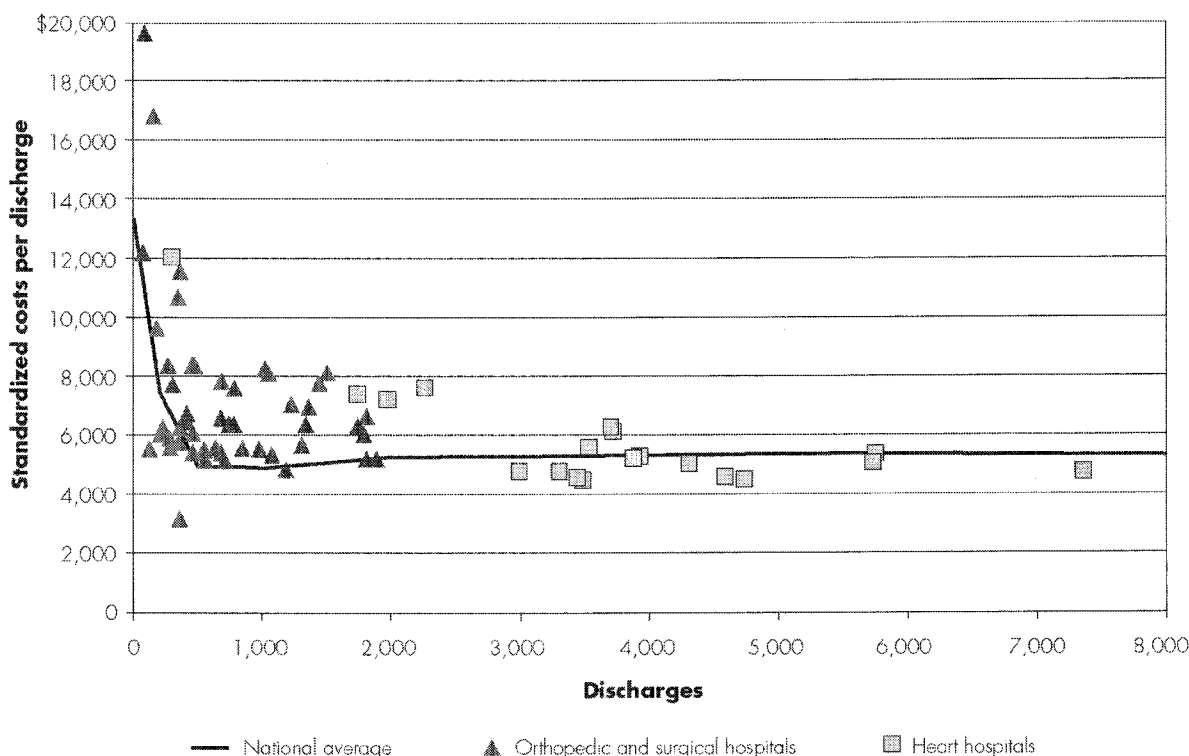
Note: Expected length of stay is the weighted average of the regional average lengths of stay for all inpatient prospective payment system hospitals in each all patient refined diagnosis related group and severity class, weighted by the specialty hospitals' mix of cases among the same categories. Peer hospitals are specialized, but are not physician owned. Competitor community hospitals are in the same market as specialty hospitals and provide some similar services. The all other hospital groups include all hospitals except the particular specialty, peer, and competitor community hospitals.

*The ratio of actual to expected length of stay is significantly lower (actual lengths of stay are shorter than expected) than for peer, competitor community, and all other hospitals in a Tukey mean separation test with a criterion value of 0.05.

Source: MedPAC analysis of 11 million Medicare hospital claims for fiscal year 2004 from CMS.

orthopedic/surgical specialty hospitals appear to account for a substantial portion—though not all—of their higher costs per discharge (Figure 2, p. 14).

Figure 2 demonstrates plainly the strong relationship between volume and costs per discharge. Orthopedic/surgical specialty hospitals operating at low volume are unable to capture the benefits of economies of scale for inpatient services, and have relatively high costs. Larger heart hospitals—those with 3,000 or more discharges—had costs that are comparable to competitor community hospital costs.

Figure 2**Low-volume specialty hospitals have higher than average costs**

Note: Costs are standardized for differences in case-mix severity, local input prices, the effects of training residents and serving a disproportionate share of poor patients, and differences in interest expenses per discharge. The national average refers to the average for all inpatient prospective payment system hospitals.

Source: MedPAC analysis of Medicare cost report data.

Physician-owned hospitals and rates of cardiac surgery

In our March 2005 specialty hospital report, we noted that markets with physician-owned heart hospitals had 4 percent more cardiac surgeries per capita in 2002 than otherwise would have been expected. This 4 percent difference was not statistically significant. The only statistically significant finding was that the rate of coronary artery bypass graft (CABG) surgeries was higher than expected in markets with physician-owned hospitals. In this follow-up study we examined data through 2004 and found that openings of physician-owned hospitals are associated with a higher rate of growth in overall cardiac surgeries through 2004 and higher than expected rates of CABG surgery through 2004, but no shift in the ratio of low-profit to high-profit surgeries.

Methodology

This section focuses on the association between physician ownership of heart hospitals and the rate of cardiac surgery per capita. Specifically, we tested whether physician investments in heart hospitals are followed by either (1) an increase in the overall number of cardiac surgeries per capita among Medicare beneficiaries living in that market, (2) an increase in certain types of surgery such as CABG, or (3) a shift toward operating on healthier (more profitable) Medicare patients in the market. During the time frame of our study (1996 to 2004), there was a large increase in most types of cardiac surgeries across the nation. We controlled for overall industry trends by comparing utilization changes in markets with physician-owned heart hospitals to utilization changes in markets without such hospitals. We did not evaluate whether increased utilization equates to better care or better outcomes.

An above-average increase in the overall rate of cardiac surgeries per Medicare beneficiary could indicate that heart hospitals are meeting a previously unmet community need or that physician investors are inducing additional demand for surgeries due to the economic incentives associated with hospital ownership. Such inducement could be direct (e.g., a cardiac surgeon–investor who recommends and performs surgery) or indirect (e.g., a cardiologist–owner recommends surgery by a surgeon who operates in the cardiologist’s hospital). While we can not determine the degree to which aggregate increases in cardiac surgeries were due to financial incentives, we can examine whether shifts in the types of surgeries performed are consistent with the investors’ financial incentives. If we see an increase in the ratio of highly profitable surgeries to less profitable surgeries, it would indicate that financial incentives may have influenced at least some physicians’ behavior. We test whether the presence of physician-owned hospitals is associated with a market-level increase in this ratio.

Profitable types of patients

In addition to testing for the overall growth in cardiac surgery following the entrance of a physician-owned heart hospital, we examine three specific types of surgery. First, we examined CABG surgery. This is a relatively high marginal profit surgery. A review of cost report data, the literature, and discussions with owners of cardiac hospitals confirmed that between \$6,000 and \$12,000 of the \$24,000 payment for CABG surgery represents marginal profit on an average patient. Our example of a moderate profit surgery is angioplasty. According to the literature and hospital financial officers, the marginal profit from angioplasty is significant, but lower than that of CABG. Our example of a historically low-profit procedure is defibrillator implantation. There was a perception in the hospital field that the cost of purchasing a defibrillator made up most of the payment for this service. While defibrillator implantation was relatively unprofitable through 2002, profitability may have improved by 2004.⁵

In addition to dividing surgical procedures by type of surgery, we divided cases by level of patient severity. Physician-owned hospitals tend to treat lower severity patients who cost less and are thus more profitable (Cram 2005, MedPAC 2005, CMS 2005). In contrast, the sickest patients require more resources and are less profitable. We tested whether physician ownership of heart hospitals is associated with a market-wide shift in surgical volumes toward lower severity

Table 8**Cardiac surgery growth rates**

Type of admission and type of market	Rate per 1,000 beneficiaries			Change	
	1996	2002	2004	1996-2002	2002-2004
All heart surgeries					
Markets with physician-owned heart hospitals:					
Open by FY 2002 (n=10)	27.5	32.0	33.6	4.5	1.6
That opened in FY 2003 (n=8)	28.3	34.0	38.3	5.7	4.3
Other markets (n=283)	27.2	31.3	32.3	4.1	1.0
Coronary artery bypass graft					
Markets with physician-owned heart hospitals:					
Open by FY 2002	5.6	5.0	4.3	-0.6	-0.7
That opened in FY 2003	6.1	5.5	4.8	-0.6	-0.7
Other markets	5.6	4.6	3.8	-1.0	-0.8
Angioplasty					
Markets with physician-owned heart hospitals:					
Open by FY 2002	8.0	11.7	12.3	3.7	0.6
That opened in FY 2003	8.5	12.4	15.0	3.9	2.6
Other markets	7.3	10.8	12.0	3.5	1.2
Defibrillator implantation					
Markets with physician-owned heart hospitals:					
Open by FY 2002	0.4	1.0	1.9	0.6	0.9
That opened in FY 2003	0.4	1.3	2.5	0.9	1.2
Other markets	0.4	1.2	1.9	0.8	0.7

Note: FY (fiscal year). Ten markets had at least one physician-owned heart hospital for all of 2002; eight markets gained a heart hospital in late 2002 or 2003.

Source: MedPAC analysis of 1996, 2002, and 2004 MedPAR data from CMS.

(and higher profit) patients. The alternative hypothesis is that the overall ratio of low-severity to high-severity patients in the market stays the same. We are not suggesting that cardiac surgeons operate on perfectly healthy patients. The question is subtler. For the marginal case, are some physicians who invest in cardiac hospitals more likely to recommend surgery on less severely ill patients when their hospital profits most from the healthier patients?

In our March 2005 specialty hospital report, we found that physician-owned heart hospitals tend to treat less severely ill patients. However, through 2002, physician-owned hospitals appear

to have a less severely ill patient mix primarily due to diverting less severely ill patients from community hospitals. If specialty hospitals are inducing a market-wide shift in the ratio of low-severity to high-severity patients, the magnitude of that shift is too small to be detected with our tests of statistical significance.

Data

We identified cardiac surgery and CABG discharges using diagnosis related groups (DRGs). Defibrillator implantation and angioplasty were identified using procedure codes from claims data because they did not have their own DRGs in 1996 (the first year of this study). We categorized patients into two severity categories using APR-DRGs (3M version 15). Patients ranked 1 or 2 on the APR-DRG severity scale were deemed less severely ill, and patients ranked a 3 or 4 on the APR-DRG severity scale were deemed more severely ill. Based on the earlier work done for our specialty hospital report, we assume that less severely ill patients are more profitable, while more severely ill patients are less profitable (MedPAC 2005).

Markets. We compare changes in the volume of surgeries per 1,000 fee-for-service Medicare beneficiaries in the 18 markets with physician-owned heart hospitals to changes in the volume of surgeries in 283 markets without physician-owned cardiac hospitals through 2004.⁶

In the 18 markets with physician-owned heart hospitals in 2004, the median heart hospital discharged 26 percent of the cardiac surgeries in its market. However, the share of cardiac surgeries varied widely from 3 percent in one market to 41 percent in another. Because the market penetration of heart hospitals varied widely in 2004, it is important to control for the market share of the heart hospital when evaluating the impact of the heart hospital on utilization in the market. Our tests of statistical significance are conducted using a multivariate fixed effects regression model. The essence of this model is to evaluate whether marketwide changes in the rate of cardiac surgery are related to the heart hospitals' market share.

Descriptive statistics

We divided our heart hospital markets into those where the heart hospital opened prior to the start of 2002 and those where the heart hospital's first full year of operation was 2003. The purpose is to see if the differences in surgery growth rates are more pronounced after the heart hospital opens and then return to more average levels. In general, the rate of cardiac surgeries grew faster in markets with physician-owned heart hospitals (Table 8). From 2002 to 2004, the number of surgeries grew by 1.6 per 1,000 beneficiaries in markets where the heart hospital was open prior to 2002, 4.3 per 1,000 beneficiaries in markets where the heart hospital opened in 2003, and by 1.0 per 1,000 beneficiaries in markets without physician-owned heart hospitals. Interestingly, heart surgeries were growing rapidly prior to 2003 in markets where the heart hospital's first full year of operation was 2003. With a couple of exceptions, angioplasty and defibrillator implantation all tended to grow faster in markets with heart hospitals than in markets without them. Bypass surgeries declined in most markets due to substitution of angioplasty for

Table 9**Per capita growth in low-severity versus high-severity surgeries**

Type of discharge	Rate per 1,000 beneficiaries			Change	
	1996	2002	2004	1996-2002	2002-2004
Low-severity surgeries					
Markets with physician-owned heart hospitals:					
Open by FY 2002	18.3	21.8	22.3	3.5	0.5
That opened in FY 2003	17.9	23.0	25.9	5.1	2.9
Other markets	17.5	20.8	21.1	3.3	0.3
High-severity surgeries					
Markets with physician-owned heart hospitals:					
Open by FY 2002	9.2	10.1	11.3	0.9	1.1
That opened in FY 2003	10.4	11.0	12.4	0.6	1.4
Other markets	9.7	10.5	11.2	0.8	0.7

Note: FY (fiscal year). Low severity refers to all patient refined diagnosis related group severity level one or two; high severity, three or four.

Source: MedPAC analysis of Medicare discharge data.

bypass surgery (Wennberg et al. 2005). However, the rate of decline was slower in markets with physician-owned heart hospitals.

We also tested whether markets with physician-owned heart hospitals had faster growth in low-severity (higher profit) patients relative to their growth in high-severity (lower profit) patients, compared to other markets. Markets with physician-owned hospitals had above average growth in both low-severity and high-severity surgeries (Table 9).

Multivariate results

It is important to avoid placing too much emphasis on the descriptive statistics due to the large differences in the market shares that heart hospitals had in 2004. For example, a heart hospital with 3,000 admissions may have a larger impact on market-wide utilization than a heart hospital with 300 admissions. To account for the size of the specialty hospital, we used the specialty hospitals' market share as the key independent variable in the fixed effects regression. The regression models test whether the share of the market held by specialty hospitals is associated with either an increase in the volume of Medicare cardiac surgeries or a shift toward operating on healthier Medicare patients. We used fixed market effects to control for differences in the characteristics of patients and practice patterns across markets. To control for nationwide changes

Table 10

**Five multivariate regression models indicate heart hospitals
are associated with increased utilization for some services, 1996 to 2004**

Explanatory variables	Changes in the volume of surgeries per 1,000 Medicare beneficiaries: regression coefficients				
	Model 1: CABG	Model 2: Angioplasty	Model 3: Defibrillator	Model 4: All cardiac surgeries	Model 5: Ratio of low- severity to high- severity patients
Physician-owned heart hospitals' market share of cardiac surgeries in percentage points	0.014* (0.006)	0.02 (0.02)	0.005 (0.004)	0.07* (0.03)	0.002 (0.002)
Year:					
2002	-0.97** (0.05)	3.47** (0.16)	0.80** (0.04)	4.17** (0.25)	0.17** (0.02)
2004	-1.74** (0.05)	4.71** (0.16)	1.50** (0.04)	5.21** (0.26)	0.06** (0.02)

Note: CABG (coronary artery bypass graft). Regression coefficients indicate the number of additional surgeries per 1,000 Medicare beneficiaries associated with a 1 percent increase in physician-owned specialty hospitals' market share. The year variables reflect the nationwide change in the rate of surgeries since 1996. Low severity refers to all patient-related diagnosis-related group severity levels 1 or 2; high severity refers to levels 3 or 4. Variables that are significantly different from zero are noted by: * $p < .05$ ** $p < .01$. Standard errors are shown in parentheses.

Source: MedPAC analysis of Medicare claims data, using a panel data set with market specific effects.

in cardiac surgery practice patterns, we included variables that account for nationwide changes in cardiac surgery practice patterns from 1996 to 2002 and 2004.

From 1996 to 2004, angioplasty, defibrillator implantation, and overall cardiac surgeries increased and the rate of CABG surgeries per 1,000 beneficiaries declined (Table 10). These nationwide trends held in markets with and without physician-owned specialty hospitals, as is shown by the large impact of the 2002 and 2004 year effects. However, the table also suggests that the entrance of physician-owned heart hospitals is associated with a statistically significant change in the rate of CABG surgeries and overall cardiac surgeries per capita.

The level of overall cardiac surgeries per 1,000 beneficiaries was estimated to increase by .07 surgeries for every 1 percent market share held by a specialty hospital. In a typical market where a heart hospital has a 26 percent market share, the model suggests that the formation of the physician-owned hospital was associated with roughly 1.82 ($.07 \times 26$) additional cardiac surgeries per 1,000 Medicare beneficiaries. This is equivalent to a 6 percent increase in cardiac surgeries. The 6 percent figure should not be viewed as a precise estimate, as the 95 percent confidence interval ranges from a 1 percent to an 11 percent increase in surgeries. We can

conclude that there is some increase in utilization, but most of the heart hospitals' 26 percent market share of cases represents cases diverted from local community hospitals, not an increase in market-level utilization.

Physician-owned hospitals opened in markets that tended to have equal or above average numbers of CABG surgeries per capita in 1996 (Table 8, p. 16). By 2004, the difference between these markets and the national average expanded. The coefficient in the regression model is .014 with a 95 percent confidence interval of .002 to .026 (Table 10, p. 19). Hence for the median market where the heart hospital has a 26 percent share of the cardiac surgery market, the model estimates that the total number of Medicare CABG surgeries was increased by roughly 0.4 surgeries per 1,000 beneficiaries (i.e., $.014 \times 26$). This is a 9 percent increase in the number of CABG surgeries above what otherwise would have been expected. The growth rates of angioplasties and defibrillator implantation when measured separately are not significantly higher in markets with physician-owned cardiac hospitals. The ratio of low-severity cases to high-severity cases did not grow significantly faster in markets with physician-owned hospitals.

Discussion of utilization issues

We found that the typical physician-owned cardiac hospital is associated with a roughly 6 percent market-wide increase in the rate of cardiac surgeries per 1,000 Medicare beneficiaries. Therefore, from 1996 to 2004, we would expect cardiac surgeries to grow by roughly 25 percent in a typical market with a cardiac hospital compared with the 19 percent growth rate observed in markets without physician-owned hospitals. We also found that the ratio of high-profit surgeries to low-profit surgeries was not significantly affected by the presence of physician-owned hospitals.

Taken together, our findings of an increase in surgeries—but no material shift in the ratio of high-severity to low-severity surgeries—are consistent with more than one hypothesis regarding physician behavior. The first hypothesis is that financial incentives only indirectly affect surgical volumes through the effect on surgical capacity. Under this hypothesis, physicians have a financial incentive to invest in cardiac hospitals, and as these hospitals are built, surgical capacity increases. More hospital capacity could lead to more surgeries. More capacity may allow for more procedures by existing surgeons and invasive cardiologists. In addition, community hospitals may try to compensate for lost cardiac-surgery market share by recruiting new cardiologists and cardiac surgeons to compete with the physician-owned facility. More surgeons and more hospital beds could lead to more surgeries even if individual surgeons' clinical decision making does not change. The second hypothesis is that some physicians' clinical recommendations are directly affected by financial incentives, but the financial incentives cause a broad shift toward more surgeries and not a precise shift toward focusing only on the most profitable cardiac surgery cases. For example, some cardiologist-investors may react directly to the financial incentives by slightly increasing recommendations for invasive procedures for all types of patients, but do not make a conscious decision to focus on only the most profitable patients. Either one of these factors could produce the 6 percent increase in surgeries that we see in markets with physician-owned hospitals.

Whether the increase in surgeries stems from increased capacity, from the financial incentives for physicians to self-refer patients to facilities they own, or a combination of these factors, increased surgeries can lead to increased Medicare spending. Some observers have suggested that physician-owned specialty hospitals are just one aspect of a broader trend toward expansion of relatively well paid service lines resulting in additional strain on the sustainability of the Medicare system (Berenson et al. 2006). A complete discussion of the literature on physician self referral and the magnitude of the incentives to increase cardiac surgery admissions is available elsewhere, and is beyond the scope of this paper (Stensland and Winter 2006).

Does the 6 percent increase in cardiac surgery rates (and associated increases in spending) improve the health or extend the lives of Medicare beneficiaries? We do not attempt to evaluate the costs and benefits of the marginal increase in cardiac surgeries. However, some have suggested that the movement of patients from medical treatment to angioplasty and even from angioplasty to CABG may improve outcomes (Hannan et al. 2005, Tarakji et al. 2006). Others suggest that geographic areas that spend more on cardiac care have not experienced more rapid improvements in outcomes (Skinner et al. 2006). Therefore, while the increased rate of cardiac surgery may increase Medicare expenditures, we can not say whether the benefits of those surgeries outweigh the increased costs.

What is the financial impact of physician-owned hospitals on competitor community hospitals?

The preceding section documented that physician-owned heart hospitals obtain most of their patients by capturing market share from competitor community hospitals. In this section we evaluate how that loss of patients affects community hospitals. We find that physician-owned hospitals are associated with slower Medicare revenue growth at competitor community hospitals, but do not have a statistically significant effect on competitor hospitals' total revenues or total profit margins.

Methodology

To determine whether the entry of physician-owned specialty hospitals has an appreciable effect on the profitability of local community hospitals, we compared financial results for hospitals that compete with physician-owned specialty hospitals to the results for similar hospitals located in markets without physician-owned specialty hospitals. We used three multivariate models to test the effect of physician-owned specialty hospitals on Medicare revenues, total revenues, and total margins.

Competitor community hospitals. In this analysis we limited the set of competitor community hospitals to those that competed with a physician-owned hospital that was open for the full year in 2004 and did not own an interest in a physician-owned heart hospital. In addition, if a hospital competed with both a physician-owned heart hospital and a physician-owned surgical hospital, we categorized it as a heart competitor.

Using this set of competitors, we obtained financial data (Medicare cost reports) from 101 competitor community hospitals that competed with physician-owned heart hospitals for cardiac surgery and an additional 102 hospitals that competed with physician-owned orthopedic/surgical hospitals (and did not compete with heart hospitals) during 2004.

Comparison hospitals. The competitor community hospitals were compared to a group of community hospitals in markets without physician-owned specialty hospitals. To be a comparison hospital to the cardiac competitors for a specific year, the hospital must have had at least 70 beds, 1,200 discharges, and at least 10 angioplasties or bypass operations in 2004. Orthopedic/surgical comparison hospitals also had to meet the same size criteria. We chose 70 beds and 1,200 discharges as cutoff points for the comparison groups because all competitor community hospitals had at least this number of beds and discharges. This allows us to compare competitors with hospitals that are at least as large as the smallest competitor community hospital.

Using these criteria, we identified 766 comparison hospitals that offer cardiac surgery and did not compete with physician-owned heart hospitals. We also identified 901 hospitals that offer orthopedic or surgical services and did not compete with physician-owned orthopedic/surgical hospitals.

Multivariate model. In 2004, the number and size of physician-owned specialty hospitals varied from market to market. Therefore, we want our key independent variable to be the specialty hospitals' market share rather than simply a dichotomous variable indicating the existence of a specialty hospital. To compute heart hospitals' market share, we divided heart hospitals' revenue in the HRR by the HRR's total hospital revenue in 2004. We computed orthopedic/surgical hospitals' market share as their revenue in the HSA divided by the HSA's total hospital revenue in 2004.⁷ This creates an approximate market share for each type of specialty hospital that can be used in the multivariate model.

Some market characteristics, such as area population and personal income, change over time. To account for these factors, the model includes variables for population growth, changes in personal income, and time trends. To control for hospital-specific characteristics that do not change over time, such as location and mission, we used a fixed-effects regression model. After controlling for demographics, time trends, and hospital specific factors, the fixed-effects model asks: Do competitor community hospitals have better or worse financial performance than we would expect given their performance prior to the opening of the physician-owned hospital, national trends, and the region's income and population growth?

Descriptive statistics

Table 11 compares hospitals that compete with physician-owned hospitals to our two sets of comparison hospitals. By design, the comparison hospitals offering cardiac surgery are similar to the community hospitals that compete with physician-owned heart hospitals. The primary difference is that physicians tend to build heart hospitals in markets with above average population growth. Likewise, the comparison hospitals offering orthopedic/surgical services are similar to the community hospitals that compete with physician-owned orthopedic/surgical hospitals.

Table 11**Characteristics of competitor community hospitals and their markets**

	Markets with physician-owned hospitals		Markets without physician-owned hospitals	
	Community hospitals competing with cardiac hospitals	Community hospitals competing with only orthopedic/ surgical hospitals	Comparison community hospitals with cardiac surgery	Comparison community hospitals with general surgery
Mean hospital characteristics				
Number of hospitals	101	107	776	901
Beds in 2004	301	225	332	147
Medicare revenue in 2004 divided by beds in 1997*	160,000	130,000	160,000	100,000
Total admissions in 2004 divided by beds in 1997*	64	57	57	46
Total revenue in 2004 (in millions)	\$260	\$173	\$301	\$92
Total profit margin in 2004	5.5%	2.5%	4.4%	2.3%
Mean characteristics of the hospitals' markets				
Population growth in the market 1997-2004	9%	12%	7%	6%
Personal income growth in the market 1997-2004	35%	31%	35%	28%
Heart hospitals' share of all cardiac surgery revenues	23%	N/A	N/A	N/A
Heart hospitals' share of all 2004 hospital revenue in the cardiac market (HRR)	4%	N/A	N/A	N/A
Orthopedic/surgical hospitals' share of all 2004 hospital revenues in the surgical market (HSA)	1%	3%	N/A	N/A

Note: N/A (not applicable), HRR (hospital referral region), HSA (hospital service area). Markets are divided into those with cardiac hospitals (which can also have orthopedic/surgical hospitals), markets with only orthopedic/surgical hospitals (no cardiac hospitals), and comparison markets.

*We divide revenue and discharges by the number of beds the hospital had in 1997 to prevent an increase in hospital beds during 1997 to 2004 from appearing to affect admissions or revenues. Mean values are shown.

Source: Medicare cost reports, Area Resource File, MedPAC survey, and Medicare discharge data.

While heart hospitals capture an average of 23 percent of the Medicare cardiac surgery revenue in their HRRs, they receive only 4 percent of total hospital revenue (for all services) in the HRR on average (Table 11). Orthopedic/surgical hospitals receive only 3 percent of total hospital revenue in the surgical health service area. Because specialty hospitals still captured a relatively small share of 2004 total revenues in their markets, it may not be surprising that their financial impact on community hospitals is limited. In 2004, there were only 12 HSAs where the sum of heart hospitals' market share and orthopedic/surgical hospitals' market share of total hospital revenues was over 10 percent. Even in these markets with a substantial specialty hospital presence, the 18 competitor community hospitals had a median 2004 total margin of 4.2 percent, which is not significantly different from the national median of 3.6 percent. The higher margin in markets with physician-owned hospitals may reflect the faster population growth in these markets.

Multivariate results

In the multivariate analysis, we are able to estimate the combined impact of physician-owned cardiac and physician-owned orthopedic/surgical hospitals on competitor community hospitals. The full regression results are shown in Appendix A. Physician-owned heart hospitals reduced competitor community hospitals' Medicare revenues. However, they did not have a statistically significant effect on competitor hospitals' total profit margins.⁸ Physician-owned orthopedic/surgical hospitals did not have any statistically significant financial effects on competitor community hospitals. This is consistent with the small market share of orthopedic/surgical hospitals.

Effect of physician-owned cardiac hospitals. Heart hospitals generate 75 percent of their revenue from inpatient services and Medicare patients represent roughly 60 percent of their admissions. For the average heart hospital, Medicare admissions generated roughly \$25 million of the \$60 million in total hospital revenue. Because heart hospitals are taking Medicare patients from competitor community hospitals, the loss of patients should cause a significant decrease or at least slow down the rate of growth in competitor community hospitals' Medicare inpatient revenues.

Model 1 of our regression model suggests that the entrance of a typical heart hospital (capturing 4 percent of total revenues in the market) will result in roughly a 5 percent decline in the Medicare inpatient revenues of competitor community hospitals ($.04 \times 183,265/160,000$) (Table A-1, p. 33). The declines for competitor community hospitals not offering cardiac surgery are somewhat less, but are still statistically significant. This suggests that heart hospitals do capture patients from the competitor community hospitals. These results may also suggest an indirect or cascade effect in which heart specialty hospitals take patients from competitors that offer cardiac surgery, and these competitors then fill their beds by taking other types of patients from community hospitals that do not offer cardiac surgery.

However, despite competitor community hospitals' loss of Medicare revenue, cardiac hospitals did not have a statistically significant effect on the total revenue or total margins of competitor community hospitals in their markets. This suggests that competitor community hospitals are

largely able to adjust to the loss of revenue from Medicare cardiac cases by obtaining additional revenues from other sources. There is no statistically significant effect on hospitals' total revenue or margins.

Effect of physician-owned orthopedic/surgical hospitals. Orthopedic/surgical hospitals tend to be much smaller (\$20 million in total revenues) than heart hospitals and generate most (65 percent) of their revenue from *outpatient* services on average. Therefore, it is not surprising that they do not have a statistically significant effect on Medicare inpatient revenues or total revenues. In addition, they do not have a statistically significant effect on hospitals' total margins.

Population growth dominates other factors. Both sets of regressions indicate that the region's population growth and nationwide trends in profitability have had a larger effect on competitor community hospital profit margins than specialty hospitals. Higher population growth significantly increases hospitals' revenue, discharges, and margins. We also see a nationwide decline in Medicare revenue and hospital margins following enactment of the Balanced Budget Act of 1997. However, Medicare revenues (inflation adjusted) recovered by 2001, following the enactment of the Balanced Budget Refinement Act of 1999 and the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000. Due to high cost growth, total margins tended to be lower in 2004 than in 1997.

Discussion of community impact

The entrance of heart hospitals into markets slowed the competitors' Medicare revenue growth. While the specialty hospitals took profitable surgical patients from the competitor community hospitals, most competitor community hospitals appeared to compensate for this lost revenue. From our site visits in 2004, we learned that in some cases competitor community hospitals cut expenses by cutting staff; in some cases they instituted "aggressive pricing strategies" to raise revenue from private payers; and in many cases they expanded profitable business lines such as imaging, rehabilitation, pain management, cardiology, and neurosurgery.⁹ These responses to the specialty hospital challenge coupled with population growth in many of the markets where specialty hospitals operate combined to allow competitor community hospitals to maintain profit margins that are in line with national averages.

As physician-owned entities capture more profitable service lines, the effect on community hospitals may increase. However, we found community hospitals' profit margins appeared stable through 2004, even in markets where physician-owned hospitals captured more than 10 percent of all admissions.

While the community hospitals can maintain their profit margins, there still may be a price to pay in the form of higher overall healthcare costs. Physicians, specialty hospitals, and community hospitals have all been expanding their profitable service lines and are providing a larger number of services per Medicare beneficiary (GAO 2006, Berenson 2006). Increasing the volume of services per beneficiary is a serious threat to the sustainability of the Medicare system. And without clear evidence that the marginal increase in utilization improves outcomes, we can not say whether the benefits of increased utilization justify the costs. ■

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Endnotes

- 1 A hospital is deemed to be physician-owned if one or more physicians have partial or full ownership of the hospital. Joint ventures between community hospitals and physicians are still considered physician-owned hospitals.
- 2 In our March 2005 study, we included two women's hospitals in the surgical category. We decided to exclude those two hospitals in this study to make the surgical hospitals a more homogeneous category.
- 3 Orthopedic and general surgery markets refer to health service areas that are used for routine hospital services by Medicare beneficiaries. These markets were described and delineated by Makuc et al (1991).
- 4 It is possible that orthopedic/surgical hospitals are less costly providers of outpatient surgeries. However, we are not able to test this hypothesis due to the need to develop a severity of illness adjuster for outpatient surgeries.
- 5 In 2002, there was a broad consensus that defibrillator implantation was relatively less profitable than other cardiac surgeries. However, in October 2003, CMS created two new defibrillator DRGs for defibrillator implantation with cardiac catheterization. DRG 535 is for patients with an acute myocardial infarction (AMI), heart failure, or shock—this DRG weight increased from 6.3376 in FY 2003 to 8.1560 in FY 2004. DRG 536 is for patients with cardiac catheterization but without AMI, heart failure or shock. On average, payments for defibrillator implantation increased by roughly 10 percent from FY 2003 to FY 2004. Due to the increases in payment rates from FY 2002 to FY 2004, decreases in patients' lengths of stay, and uncertainty regarding changes in device prices, the relative profitability of defibrillator implantation is less clear in FY 2004 than in FY 2002.
- 6 Five of the 306 Dartmouth Atlas HRRs were eliminated from our analysis due to having either a physician-owned hospital open mid-way through 2004, the sale of a physician-owned hospital to a nonprofit entity, or an unusual volatility of cardiac surgery volumes.
- 7 We divide the specialty hospitals' aggregate revenue in each year (e.g., 2003) by the market's total hospital revenue in 2004. We always divide by the same year's total revenue to prevent changes in the dependent variable (changes in community hospital revenue) from affecting the independent variable (specialty hospital revenue/all hospitals' revenue).
- 8 We also tested for the impact of physician-owned heart and orthopedic hospitals on hospitals' operating margins and found no significant effect.
- 9 The GAO (2006) found that community hospitals in markets without specialty hospitals engage in many of the same strategies to enhance revenue including expansion of bariatric services, imaging centers, and cardiology services. The GAO study had limited information on how pricing policies change when specialty hospitals enter a market.

A P P E N D I X

A

Regression results

Table A-1

Impact of physician-owned heart hospitals on other hospitals that furnish angioplasty and bypass services

Explanatory variables	Regression coefficients		
	Model 1: Community hospitals' Medicare inpatient revenue per 1997 bed ^a	Model 2: Community hospitals' total revenue per 1997 bed ^a	Model 3: Community hospitals' total margin
Physician-owned specialty hospitals			
Physician-owned heart hospitals' market share in the HRR ^b	-183,265* (72,300)	-402,219 (336,273)	-8.1 (24.3)
Physician-owned orthopedic or surgical hospitals' market share in the HSA ^b	64,533 (36,873)	-63,900 (184,462)	18.0 (12.1)
Demographic characteristics			
Percent change in population in the HSA, relative to the nation's growth	91,245** (23,151)	480,491** (107,376)	22.8** (3.9)
Percent change in per capita income in the HSA, relative to the nation's growth	N/A	307,809** (91,920)	3.2 (4.0)
Year (relative to 1997):			
1998	-3,562**	17,202**	-1.4**
1999	-4,212**	37,882**	-2.4**
2000	-3,182**	57,567**	-2.4**
2001	4,286**	90,342**	-2.4**
2002	10,403**	128,817**	-2.7**
2003	11,267**	160,678**	-1.9**
2004	15,826**	185,838**	-2.2**
Number of hospitals in the data set	930	930	930

Note: HRR (hospital referral region), HSA (hospital service area). Data are for community hospitals. Regression coefficients reflect the effect of a 1 percent increase in physician-owned specialty hospitals' market share on community hospitals' Medicare revenue, total revenue, and total margins. Standard errors are in parentheses. The model was computed using a generalized least squares fixed effects model with robust standard errors.

* P<.05

** P<.01

^a Revenues per bed are adjusted to correct for differences in input prices across regions using the CMS wage index. Revenues are deflated to 1997 dollars using the CMS hospital market basket. Beds are fixed at their 1997 level to prevent hospitals that build new capacity from appearing to have lower demand for inpatient services per bed.

^b The HRR refers to the Dartmouth Atlas cardiac surgery referral regions. The HSA refers to market areas for general surgery. Market share is the specialty hospitals' aggregate revenue for that specific year divided by the market's revenue in 2004. The denominator in the ratio (2004 revenue) is held constant across all years to prevent changes in community hospitals' performance from affecting market share (the independent variable).

Source: MedPAC analysis.

Table A-2

**Impact of physician-owned specialty hospitals on hospitals
that do not provide angioplasty or bypass services**

Explanatory variables	Regression coefficients		
	Model 1: Community hospitals' Medicare inpatient revenue per 1997 bed ^a	Model 2: Community hospitals' total revenue per 1997 bed ^a	Model 3: Community hospitals' total margin
Physician-owned specialty hospitals			
Physician-owned heart hospitals' market share in the HRR ^b	-140,241 ** (37,983)	-321,480 (196,960)	10.9 (23.0)
Physician-owned orthopedic or surgical hospitals' market share in the HSA ^b	2,096 (26,834)	-10,872 (105,620)	0.6 (20.3)
Demographic characteristics			
Percent change in population in the HSA, relative to the nation's growth	107,083 ** (13,687)	474,305 ** (91,519)	14.4 ** (4.4)
Percent change in per capita income in the HSA, relative to the nation's growth	N/A	432,479 ** (181,579)	-7.3 (4.2)
Year (relative to 1997):			
1998	-4,127 **	16,031 **	-1.6 **
1999	-4,978 **	30,563 **	-2.4 **
2000	-6,003 **	43,737 **	-2.3 **
2001	-2,678 **	65,636 **	-2.3 **
2002	-126	89,289 **	-2.7 **
2003	-128	106,697 **	-2.6 **
2004	1,549	121,981 **	-2.9 **
Number of hospitals in the data set	942	942	942

Note: HRR (hospital referral region), HSA (hospital service area), N/A (not applicable). Data are for community hospitals. Regression coefficients reflect the effect of a 1 percent increase in physician-owned specialty hospitals' market share on community hospitals' Medicare revenue, total revenue, and total margins. Standard errors are in parentheses. The model was computed using a generalized least squares fixed effects model with robust standard errors.

* P<.05

** P<.01

^a Revenues per bed are adjusted to correct for differences in input prices across regions using the CMS wage index. Revenues are deflated to 1997 dollars using the CMS hospital market basket. Beds are fixed at their 1997 level to prevent hospitals that build new capacity from appearing to have lower demand for inpatient services per bed.

^b The HRR refers to the Dartmouth Atlas cardiac surgery referral regions. The HSA refers to market areas for general surgery. Market share is the specialty hospitals' aggregate revenue for that specific year divided by the market's revenue in 2004. The denominator in the ratio (2004 revenue) is held constant across all years to prevent changes in community hospitals' performance from affecting market share (the independent variable).

Source: MedPAC analysis.

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